Poverty reduction through energy projects

Final report

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Abbreviations

CAP	Country assistance plan
CDO	Community development organization
COI	Cost of illness
CPI	Core poverty intervention
CUE	Cost of unserved energy
CVM	Contingent valuation method
DMC	Developing member countries
EIA	Environmental impact assessment
ERPA	Energy resources of the poverty alleviation
GDP	Gross domestic product
HC	Head count
ISA	Initial social assessment
JFPR	Japanese Fund for Poverty Reduction
LEPC	Liaoning Electric Power Company
LPG	Liquified petroleum gas
MW	Mega watt
NGO	Non-government organization
NPC	National Power Corporation
NRSE	New renewable sources of energy
ODI	Other development interventions
OIE	Outer Island Electrification Program
PCR	Project completion report
PI	Poverty intervention
PII	Poverty Intervention Indicator
PIA	Poverty impact assessment

PIAP	Poverty impact analysis of projects
PIR	Poverty impact ratio
PLN	Perusahaan Perseroan
PPTA	Project preparatory technical assistance
PRA	Poverty reduction analysis
PRC	People's Republic of China
RRP	Report and Recommendations to the President
SA	Social assessment
SDO	Secondary development objective
SDP	Sector development plan
SI	Staff instructions
TERI	Tata Energy Research Institute
TOR	Terms of reference
TRANSCO	Transmission company
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WB PSB	World Bank's Participation Source Book
WB	World Bank
WTP	Willingness to pay

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Executive summary

Objectives of the study

Poverty is a global challenge and its alleviation is among ADB's (Asian Development Bank's) overarching goals. The Bank aims to devote no less than 40 per cent of its public sector lending to poverty interventions by 2001, and graduate to more core poverty interventions by 2002. Energy projects, with direct and indirect implications for poverty alleviation, can substantially contribute to this objective.

Efficient provision of energy not only contributes to poverty reduction indirectly through economic growth, but being central to basic human needs of nutrition, health and education, energy services also have a direct bearing on poverty reduction Energy production and consumption are also inextricably linked with the state of natural resources like forests on which the poor are directly dependent.

However, energy sector operations of the ADB have been mostly recognized as contributing to poverty reduction indirectly through their support to economic growth. Their direct contribution to poverty reduction has been seldom acknowledged, mainly because of the lack of a systematic approach to assess such impact.

The purpose of this study is to develop a methodology and approach that would enable poverty reduction analysis of the IEEN's energy projects as well as to identify means to enhance their poverty reduction impact. This report seeks to evolve a methodology for the estimation of direct and indirect impacts of IEEN's energy projects on poverty alleviation as also for enhancement of such impacts.

Energy-poverty linkages

Poverty is multi-dimensional. Poverty, in a wider sense is deprivation, which may be traced to five inter-related clusters of disadvantages: physical weakness (lack of strength, under-nutrition, ill health, disability, high ratio of dependants to active adults); isolation (physical remoteness, ignorance, lack of access to information or knowledge); income poverty (lack of income and wealth); vulnerability (increased exposure to contingencies, danger of becoming more deprived); and powerlessness (inability to cope, adapt and choose) Energy in itself is a near basic human need depending on its use in a given place and has enormous potential in addressing poverty in its many dimensions.

Energy projects can contribute to poverty reduction at the macro and micro levels and these impacts may be observed at the supply end or at the point of consumption.

Energy poverty linkages at the point of energy supply

At the macro level, energy projects contribute to poverty alleviation primarily through resource savings on account of energy efficiency gains, forex savings/earnings and increase in tax revenues due to employment. These resources can be invested in poverty alleviation programmes. Projects that promote efficiency in energy supply may also lower the price of energy making it more affordable. Backward linkages of energy development (iron and steel, transport etc.) will also induce economic growth. However, for such benefits to flow to the poor, appropriate pro-poor policies and strategies need to be in place. At the project site, direct impacts on poverty will be felt through employment created during the construction and operation stages of the project Those in the vicinity of the project would also be affected by environmental (e.g air pollution) and social (e.g. displacement of people from project site) impact.

Energy poverty linkages at the point of consumption

Projects that provide access to energy, increase its reliability, and/or improve its affordability can result in poverty alleviation at a micro level. There are four major consumers of energy: households, agriculture, industry/commercial and transport. Each of these sectors is dependent on energy for a variety of uses, and energy consumption in these sectors can in turn impact poverty in many ways as discussed below. At a macro level, energy consumption indirectly impacts on poverty through the trickle- down effects of energy-induced growth.

Energy consumption in households

Households use energy for a variety of uses: cooking, lighting, water heating, and space conditioning. The provision of superior energy sources like electricity and LPG, has important economic and social implications because of significant monetary and non-monetary benefits vis-à-vis the use of traditional fuels.

The rural poor spend considerable time in the collection of fuel-wood: the distance travelled to gather fuelwood is progressively increasing with increased deforestation Thus provision of modern forms of energy would also contribute fuelwood shortages induce households to adopt different kinds of coping strategies. households may be compelled to substitute fuelwood with inferior biomass fuels which lead to increased air pollution, and increased tending time or they may cook less often. Health damages associated with the use of traditional fuels have important gender and long-term implications because women and young children are the most affected due to their predominant roles in collection and combustion of traditional fuels. Incidence of disease has obvious economic implications in terms of reduced productivity and increased expenditure treatment.

In the context of lighting, the provision of electricity makes it possible for the poor to gainfully utilize longer hours for studying or other activities that contribute to enhancing the capabilities of the poor. Energy is also an important input in the provision of such social infrastructure as street lighting, piped water, television and better-equipped hospitals and schools.

Energy consumption in agriculture

Agriculture is the main source of livelihood of a large share of the population in rural areas in developing countries. The sector's dependence on energy has witnessed a rapid rise as agricultural activities have become modernized and mechanized. Direct energy uses range from land preparation, sowing, irrigation, fertilizer application, harvesting, and transport to agro industries. The provision of energy to agriculture can contribute to poverty reduction directly in atleast three ways. It may reduce the cost of energy by making available, cheaper, more efficient and convenient options like electricity, thereby benefiting farmers dependent on groundwater. Second, it may augment farm incomes through an increase in the gross cropped area either due to an increase in cropping intensity or area (net) under cultivation. Third, farm employment may increase as the gross cropped area goes up. Thus, not only do the landed poor benefit but also the landless as employment opportunities increase. Growth of agro-based industries in rural areas would also create employment opportunities.

Energy consumption in industry

The industrial sector is the largest consumer of energy. The sector uses energy as one of the basic and prime inputs. The provision of energy in an energy deficit area can thus promote industrial growth by encouraging new industries or enhanced capacity utilisation in existing industries. Not only will this lead to the creation of employment opportunities in the area but would also set off a multiplier effect on output and employment throughout the economy. At the same time, however, as the scale and spread of industrial activity rise, associated environmental risks may get aggravated in the absence of appropriate safeguards.

Framework for assessment of poverty reduction impact of energy projects

Review of existing methodology

As stated earlier, the Bank aims to address poverty, directly or indirectly through all its public sector loans, such that not less than 40 percent of lending volume contributes to PI (poverty interventions), including CPI (core poverty interventions). The difference between poverty interventions and other ADB projects and programmes lies in the manner in which these contribute to poverty reduction: whereas poverty intervention projects would have clear poverty reduction impacts, in the case of other interventions, the impacts on poverty-though real-may not be immediately obvious. Classification of a project/programme as PI or otherwise is hence to be based on an assessment of distribution of benefits.

The assessment methods for anticipating effects and measuring impacts of loans on the poor include quantitative and qualitative approaches, which complement each other. Qualitative methods employed include problem tree analysis and logical framework, and are aimed at clearly charting out the impact of energy interventions in poverty reduction. These tools are also useful in identifying policies and institutions that foster or hinder the flow of project benefits to the poor.

The 'quantitative analysis' for measuring benefits and poverty impact involves the estimation of PIR (Poverty Impact Ratio). This requires a distribution analysis and a poverty impact analysis in addition to the standard economic analysis. Under the distribution analysis, the income effects of a project for various groups (consumers, government/economy, and labour, etc) that gain or lose through the project are estimated. Following this, the poverty impact analysis estimates the proportion of each group's gains or losses that go to the poor.

The PIR and proportion of poor in project beneficiaries constitute key elements in the Bank's classification system. For a PI project, the proportion of poor among loan beneficiaries, should be significantly higher than their proportion in the overall population of the country, and in no case less than 20 per cent. Once a loan is classified as PI, it may fall into the subcategory of core poverty intervention (CPI), if the majority of the loan beneficiaries is below the poverty line and reap the majority of the project benefits.

While the guidelines laid down for the qualitative assessment are extensive, these would need to be modified/customised to serve as inputs into poverty impact assessment of energy projects, taking into account energy-poverty linkages. The modified approach is summarised in the next section.

Turning to the PIR approach, the method though a useful extension of the economic analysis of projects, tends to inadequately account for some non-income benefits to poor (e.g., health impacts), or indirect income benefits (e.g., time saved, additional industrial and agricultural employment due to increased availability of energy).

Secondly, to estimate the economic value of energy to consumers, the current method uses the "willingness to pay (WTP) concept" calculated using the value of the most likely or next best alternative available for consumers. This may not be a true reflection of the WTP by the poor given that markets typically do not exist for traditional fuels used by the poor. The method also does not adequately reflect time and health costs implicit in the use of traditional fuels.

Thirdly, the Bank recommends that marginal government expenditure be treated as distribution neutral i.e. the poor will share in net government benefits in direct proportion to their share in GDP (ADB 2001). The share thus derived would be unduly affected by income inequalities and fail to reflect governments' pro-poor policy orientation.

In light of these concerns, a modified assessment framework is suggested in the next section.

Recommended methodology

Qualitative assessment

Based on the Bank's existing guidelines for social assessment of projects/ programmes, the following customised approach is recommended for energy projects:

1. *Preparing a poverty profile of the project area of influence*

The following data should be collected through secondary studies or primary surveys to establish the poverty profile of the project area.

- Income and wealth: average per capita income, proportion of households below the poverty line; land-holding; cropping patterns; level of agricultural income; level and pattern of industrialization, capacity utilization and employment in key industries; wages for skilled and unskilled labour

- Energy
  - In households: current fuel use pattern for cooking, heating, lighting and space conditioning; focus on extent of dependence on biomass fuels; estimates of indoor air pollution (concentration and exposure)
  - In agriculture: use of electric and diesel pumpsets for irrigation; extent of use of electricity for other agricultural activities;
  - In industry: Energy use per unit of production in key industries; reliability of supply (production time lost, self-generation, reserve margin)
- Expenditure on energy: by various categories of households, farmers and industries
- Access to infrastructure: roads, education and health facilities, safe drinking water, telecommunications, TV/broadcasting, markets.
- Demographic: rural/urban composition, fertility, mortality, migration, and literacy.
- Health: incidence of air and water-borne diseases
- Institutional aspects: participation of the poor and illiterate in the local decision-making process; governance (including pro-poor laws and policies); access to micro-credit
- General macro-economic health (of the province or country): GDP growth, inflation, percentage of poor, average per capita income.

The objective of this exercise is to assess the current status of the project area in terms of extent and nature of poverty in all its dimensions

2. *Identification of affected groups of population and the most vulnerable classes in these groups*

This is relatively simple for specifically targeted projects/project components like rural electrification, power distribution projects or decentralised renewable energy projects For others such as power generation projects, there is a need to identify areas that are likely to get additional or improved quality of energy because of the project.

It is also important to identify the most vulnerable classes among those affected. These would include, *interalia,* households below the poverty line, those without access to modern energy forms, those who do not own any assets, particularly land, and unskilled labour (Table 2.1).

Several groups are also likely to be adversely affected by certain components of energy projects – generally by way of displacement or loss of employment or property. These groups need to be identified; appropriate and adequate compensation must be worked out in consultation with them and these compensation costs and mechanisms are to be factored in early in the project planning cycle.

3. Needs assessment and problem tree analysis

The problem tree analysis developed in consultation with local communities, along with poverty profile would help identify the problems faced by a community and causes thereof. Construction of the problem tree would require discussions with the affected people not only on their day-to-day energy related problems, but would also require survey staff to explain how energy could link up with other factors (such as availability of water and other services) to solve some of their problems. The participatory approach as recently adopted in the Bank's TA 5894 REG entitled 'Facilitating capacity building and participatory activities' in Tajikistan should be extended to all the future Bank projects.

4. Objective tree analysis: tracing the effects and impacts of energy projects

The Bank requires all projects to prepare an objective tree at the start of the project operation cycle and to study cause-effect relationships in a way which can lead to a strategic solutions to problems identified in the problem tree analysis. It is recommended that a detailed energy- poverty reduction objective tree be prepared for all energy projects/programmes.

The tree could trace the direct and indirect benefits/beneficiaries of any project/programme. For example, in case of a power transmission or a generation project, the objective tree could be constructed to account for the different beneficiaries of the project. Tier 1 beneficiaries would be physically connected to the project (e.g., residential consumers). The benefits to hitherto non-electrified households (now possibly dependent on fuelwood for cooking and kerosene for lighting) would be quite substantial as discussed earlier. For households that already have access to electricity, the benefits are incremental in terms of access to more reliable supplies and hence reduced dependence on alternatives like diesel generators.

Tier 2 beneficiaries would be those who benefit through employment generated by industry, commerce, agriculture and other sectors that directly use the electricity from the project. Through the objective tree, it may be possible to trace further levels of beneficiaries on account of the forward and backward linkages of the project. Such an analysis would also provide important insights into how programme loans such as for tariff reforms, efficiency improvement and sector restructuring would have indirect but significant impacts on poverty reduction, possibly over the long term.

Quantitative assessment

Based on the detailed qualitative assessment, the following quantitative analysis should be carried out wherever possible. The recommended framework examines macro-economic as well as direct impact on poverty at the supply end and the point of consumption. While these benefits have been discussed earlier, the following section discusses their estimation.

Benefits at the supply end

On the supply side, energy projects/programmes can contribute to poverty alleviation indirectly by fostering macro economic growth or efficiency. Energy projects will also have direct impact on the poor by creating employment at the project site. Those in the vicinity of a project are also likely to be affected by the environmental effects of the project.

Macro economic impact includes resource savings to the government (on account of energy efficiency gains, reduced energy imports, reduced energy losses, for instance) and increased revenues (tax revenues from incremental employment and income due to the project). The proportion of these benefits accruing to the poor may be determined by the percentage of government spending on poverty alleviation programmes (on health, primary education, water supply and sanitation, employment schemes, rural development and so on).

Direct impacts to the poor will flow during project construction and operation stages through the creation of employment especially for unskilled labour in the region. On the other hand, most large energy projects impose high environmental costs, which may affect the poor disproportionately. These impacts may be estimated as below:

- *Employment benefits* of the project may be valued at the shadow wage rate. Total employment benefits may be valued at the weighted average of shadow wage rates for various labour categories. The share of the poor in total employment can be estimated from the share of unskilled labour in the total.
- *Environmental costs* may be estimated by the health costs of emissions. The proportion of environmental costs borne by the poor is given by the share of the affected population living below the poverty line. This may be an

underestimate in that the poor being more vulnerable are affected disproportionately.

Benefits at the point of consumption

Energy consumption in various economic sectors can have considerable benefits for the poor as discussed earlier. The valuation of some of these benefits is discussed below. It needs to be pointed out at the outset that some very important benefits of energy services are intangible, and hence difficult to place a value on.

Energy consumption in the residential sector

Some of the quantifiable benefits of providing poor households access to modern fuels include :

- *Savings* in time/money spent in gathering traditional fuels may be captured by the value of traditional fuels replaced. In the absence of realistic economic value of such fuels (values that reflect the ecological and social costs of these fuels), the price of these products at the nearest market can be used (which typically capture atleast the value of time spent in the collection of these fuels).
- *Time saved* in cooking, on account of use of more efficient energy carriers may be valued using the shadow wage rate
- *Health costs* of indoor air pollution averted may be estimated by the likelihood of various diseases (using 'dose response functions', given pollutant concentrations and exposure levels) and valued using the cost of illness approach (details in Box 3.1).

It needs to be reiterated here that parallel investment in credit schemes, subsidies and delivery systems are essential to ensure that the potential benefits of energy projects permeate to the poor.

Energy consumption in the agriculture sector

Agriculture is the primary source of livelihood in rural areas. Any project that provides incremental or more reliable energy to the rural agricultural sector may benefit the poor atleast in the following ways.

- *Increase in income* may be estimated by the incremental value added on all landholdings due to increase in gross cropped area (due to increase in cropping intensity or increase in net area under cultivation) or decline in energy costs. The share of the poor would be the valued added on small and marginal landholdings.

- *Employment benefits* to the poor may be estimated using employment norms for the principal crops and the increase in gross cropped area. These may be valued at the shadow wage rate for agricultural labour.

Energy consumption in the industrial/commercial sector
Industrial growth impacts poverty reduction by creating employment opportunities and through the trickle down effect of economic growth

Employment benefits may be estimated as follows :

- *Increase in total employment in existing industries* can be estimated by the employment potential of improved capacity utilisation, valued at the weighted average of the shadow wage rates for various labour categories. The share of unskilled labour in the employment generated would reflect the benefits to the poor

In case it is possible to foresee the growth of new industries, the employment potential of these can be estimated similarly.

Poverty impact ratio

The PIR (Poverty Impact Ratio), thus, is the ratio of share of the poor in total benefits (macro-economic; project construction and operation; and consumption in households, agriculture and industry) using the above framework[1].

The PIR calculated using the above framework differs from the existing practice as applied recently in IEEN's two energy projects (namely Loan No. 1817 TAJ: Power Rehabilitation Project in Tajikistan, and RRP: 29505: Power Transmission Interconnection and Reinforcement Project in Philippines) as regards coverage of benefits and the method of estimation. The suggested methodology covers more benefits, direct and indirect. However due to practical problems, some important benefits have been left out of the analysis. For instance, in the household sector, benefits such as increased capability due to enhanced education and employment opportunities arising out of provision of modern energy forms and the resulting income security, have not been captured. Similarly, in the case of employment benefits in the industrial/commercial sector, the multiplier effect on employment is not captured. The methodology also attributes the entire employment gains to increased energy availability/ consumption, though increased energy would need to be accompanied by increase in all other inputs including raw materials.

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[1] The data requirements for the calculation of the PIR have been outlined at Table 3 1

The framework for estimation of benefits to the poor, as suggested above, may not be applicable in projects/project components where beneficiaries are not identifiable such as in the case of generation and transmission projects. In such cases, a macro poverty intervention indicator (PII) would be needed to assess the share of poor in incremental energy availability. This macro indicator may be estimated as a weighted average of the share of "poor" in various energy deficit sectors, the weights being the sectors' share in total energy deficit (details in Table 3 2). The PIR and/or PII need to be used in conjunction depending on whether or not beneficiaries are identifiable for different project components.

On the basis of a detailed qualitative and quantitative assessment, the project can be classified as PI (poverty intervention), CPI (core poverty intervention) or thematic. The project may be classified as poverty intervention if the share of poor in total beneficiaries is more than the national average and the PIR/PII exceeds 20%. If the PIR/PII exceeds 50%, the project can be classified as CPI. A checklist for such classification has been suggested in Figure 3.5.

Analysis of IEEN projects

An analysis of select IEEN energy projects undertaken prior to 2001 shows that in the past, most of the energy projects did not adopt qualitative or quantitative methods, for assessment of their poverty impacts ex-ante (for details see Annexure 5.1).

The IEEN's projects in pipeline during 2001-03 lay considerable emphasis on generation and transmission in the DMCs (developing member countries). About 32 percent of the proposed investment is expected to flow to these kind of projects (Table 1).

Table 1 IEEN pipeline 2001-03: type of projects

Type	As per cent of total project loan
Generation and transmission	32 35
Rural electrification[a]	24 12
Renewables	10
Environment related projects	21 76
Others	11.76

[a]Assuming that outer island electrification project in Indonesia falls in this category

An approach for adopting quantitative assessment of poverty impact has been suggested for each of the projects (see chapter 5). Depending on the project components, the estimation parameters will vary across projects.

A detailed application of the suggested framework has been done in the case of the Shen Da System Improvement and Electrification Project (PRC) The project envisages establishing additional 500 KV transmission line facilities, connecting rural household in Liaoning, and closing down of inefficient and polluting power plants. It is recommended that the project officer should undertake poverty reduction analysis on the following issues as indicated below·

a) how macro economic 'performance' affects poverty reduction,
b) rural electrification in Liaoning; its effects on poverty reduction, and
c) environmental improvements due to closing down of inefficient coal fired power plants.

Macroeconomic impact

The annual macro economic impacts (B_M) of this project may be estimated by the sum of the value of electricity saved per year through reduction in T&D losses, and likely enhancement in annual tax revenues from the expected increase in agricultural and industrial income. Electricity savings may be valued using the prevailing power tariff. Increase in agricultural income may be estimated using the valued added on increased gross cropped area and increase in industrial income would be equal to the incremental value added from new and existing industries Of B_M, a portion equivalent to the percentage of government spending on poverty alleviation programmes would constitute the macro economic benefits accruing to the poor (B_{MP}). There may be other equally important indirect macro economic benefits such as second tier employment and income gains, fiscal stability arising out of increased revenue to/reduced spending by the government.

Impact in project area

The Shen Da project, PRC has two distinct components· closing down of the inefficient and polluting power plants in Dalian, falling under the project area of influence, and rural electrification in Liaoning.

Component I

The first component has the following quantifiable impacts:

1. Improvement in environmental quality.
2. Loss in employment.

1. Improvement in environmental quality

As explained in chapter 3, simulation models to estimate changes in ambient air quality along with dose response functions can be used to estimate environmental costs averted. The steps involved are as follows:

- Estimate changes to ambient air quality and prepare a concentration profile for the area around the plant using ambient air quality simulation models during the environmental assessment of the project (these models require data such as emission loading, stack height, wind speed, and direction).
- Use the concentration profile and the population profile to estimate the population under risk. Estimate the health impact of main air pollutants using dose response functions drawn from epidemiological studies done for similar regions.
- Use primary surveys/secondary information and discussions with local medical professionals to estimate the treatment costs for various health problems. Value of days lost can be estimated at the shadow wage rate.
- Total environment benefits from closing down of inefficient plants (B_E) will be given by the net present value of the value of environmental costs averted (cost of treatment and value of days lost) over the lifetime of the project.
- The share of poor (B_{EP}) in total environmental costs averted may be estimated by the percentage of affected population living below the poverty line.

2. Loss of employment

Total annual losses can be calculated as follows:
Persons laid off * shadow yearly wage rate (average for skilled and unskilled labour).

Annual losses to the poor can be calculated as follows:
Unskilled labour laid off * Shadow yearly wage rate for unskilled labour.

Total employment losses (B_L) from the closing down of plants will be given by the net present value of the wages lost annually over the remaining lifetime of the plant being shut down. Similarly, losses for the poor (B_{LP}) will be estimated by the net present value of the wages of unskilled labour lost annually over the remaining lifetime of the plant being shut down.

Component II

The impact of the rural electrification component will result from consumption in (1) household, (2) agricultural and (3) industrial sector

1. The household sector

- Net annual savings in time and money due to provision of reliable electricity may be estimated as given below:

a) Net benefits for poor households is equal to

(Volume of traditional fuel and/or kerosene replaced by electricity* Market price of traditional fuel) – (Units of electricity required * Electricity tariff) - (Annualised costs of electricity connection and electric appliances)

b) Net benefits for non-poor households (that are assumed to have access to electricity) is equal to

(Estimated units of electricity consumption* WTP for electricity) – (Current electricity consumption * Electricity tariff) - (Annualised costs of new electric appliances)

- Assuming that households use electricity for cooking[2], the value of time saved annually due to use of efficient fuels for cooking is calculated as under.

a) for poor households

(Time spent on cooking with traditional fuels – Time required for cooking using efficient fuels – Time required for additional meals that may be cooked) * Shadow wage rate for unskilled labour

b) for non-poor households

The impact on non-poor households which have access to electricity would be minimal.

- The health costs of indoor air pollution resulting from use of traditional fuels in poor households can be calculated as under:

a) for poor households

The total cost of each ailment may be assessed as follows:

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[2] This would need to be verified through primary survey.

(Number of individuals likely to contract the disease)* (Treatment cost for the disease + (Likely number of person days lost * Shadow wage rate for unskilled labour)

This methodology may be used to estimate the costs of various ailments attributable to use of traditional fuels. These could then be summed up to arrive at the total cost of illness. The rural electrification project would enable poor households to avert this cost of illness. Thus, this would be one of the benefits accruing to the poor as a result of the project. Corresponding benefits for the non-poor would be negligible.

Total benefits (poor and non-poor) in the household sector (B_H) would, therefore, be the sum of net annual savings in time and/or money due to provision of electricity, value of time saved annually due to the use of efficient fuels for cooking, and health costs averted. Corresponding benefits accruing to the poor may be represented by B_{HP}

2. The industrial sector

In the case of industries in the area of influence of the Shen Da project, PRC, the employment benefits of improved capacity utilisation in existing industries are calculated as:

a) Total employment benefits in existing industries

Number of additional shifts possible due to increased availability of energy* total employment per shift* Shadow wage rate (average for skilled and unskilled labour).

b) Employment benefits to the poor in existing industries

Number of additional shifts possible due to increased availability of energy* Total employment of unskilled labour per shift* Shadow wage rate of unskilled labour

- The employment benefits of new industries[3] are calculated as:

a) Total employment benefits in new industries

Total employment potential of the industries * Average shadow wage rate

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[3] This is possible to estimate only if primary surveys or secondary information indicate whether availability will facilitate setting of new industries (and if yes, which ones).

b) Employment benefits to the poor in new industries
Total employment of unskilled labour in the industries * Shadow wage rate of unskilled labour

In the industrial sector, total employment gains may be represented by B_I and employment gains for unskilled labour by B_{IP}.

3. The agricultural sector

In the case of agriculture in the project area of influence, additional or more reliable electricity for agriculture can impact poverty in the following ways:

- Reduced energy costs

a) Total benefits: estimated for large, small and marginal farmers
(Volume of alternative fuels like diesel replaced by electricity for running pumpsets* Market price of alternative fuels) – (Units of electricity required * Electricity tariff)

b) Benefits to the poor: estimated for small and marginal farmers
(Volume of alternative fuels like diesel replaced by electricity for running pumpsets* Market price of alternative fuels) – (Units of electricity required * Electricity tariff)

The information on current fuel consumption and likely substitution by electricity would have to be collected through a survey of large, small and marginal farmers.

- Increased value added on all landholdings arising out of an increase in gross cropped area due to increase in cropping intensity or additional land under cultivation

Total benefits: estimated for large, small and marginal farmers

$$[\text{Increased area under cultivation}]* \\ [(\text{Output per unit area} * \text{Price of output}) - \sum_{inputs}(\text{Input per unit area} * \text{Price of input})]$$

Benefits to the poor estimated for small and marginal farmers

$$[\text{Increased area under cultivation}]* \\ [(\text{Output per unit area} * \text{Price of output}) - \sum_{inputs}(\text{Input per unit area} * \text{Price of input})]$$

A primary survey would be needed to assess whether farmers would increase cropping intensity or bring additional land under major crops if energy from the project is made available. Output production and input use norms per unit area would be based on existing studies while the prices of inputs and outputs would be market determined on the assumption that these changes are too small to affect the market prices or that there are support prices set by the government.

- Employment generated due to increase in cropping intensity or additional land under cultivation.

a) Employment benefits to the poor:
(Increased gross cropped area)* (Employment per unit area) * (Shadow wage rate in the farming sector)

The entire employment benefit in agriculture would accrue to poor farmers. Employment benefits can be estimated using employment norms for the principal crops and the shadow wage rates In the agricultural sector, the income gains (reduced energy costs or increased value added) and employment gains would capture total benefits in the sector (B_A), while benefits to the poor (B_{IA}) would equal income gains on small and marginal holdings and all employment gains.

For estimation of net benefits in the agricultural sector, secondary information would be needed on landholding distribution, main crops in the region, yields, level of the water table (to study whether additional groundwater extraction for irrigation of increased gross cropped area, is possible or desirable).

To sum up, the main project benefits- total and to the poor are as follows:

a) Macro benefits.

Total: $B_1 = $ NPV of B_M over the lifetime of the project

Poor: $B_{1P} = $ NPV of B_{MP} over the lifetime of the project

b) Environmental costs averted and employment losses due to closure of inefficient plants at Dalian.

Total: $B_2 = B_E - B_L$

Poor: $B_{2P} = B_{EP} - B_{LP}$

c) Electricity consumption benefits in residential, agricultural and industrial/commercial sectors.

Total: B_3 = NPV of $(B_H + B_A + B_I)$ over the lifetime of the project

Poor: B_{3P} = NPV of $(B_{HP} + B_{AP} + B_{IP})$ over the lifetime of the project

The PIR defined as the ratio of benefits accruing to the poor to the total project benefits would be given by:

$$\text{PIR} = \frac{B_{1P} + B_{2P} + B_{3P}}{B_1 + B_2 + B_3}$$

During the above analysis, it has been assumed that the incremental electricity transmitted will be used for rural electrification in Liaoning. If electricity is made available to urban areas, the above analysis of calculation of impact at the energy consumption stage should be extended to these areas as well for calculation of benefit accruing to the poor in the urban areas

In case the transmission facilities feed a large area and the beneficiaries are not identifiable, a macro indicator- the PII may be used to estimate the share of poor in the project beneficiaries. The PII is the weighted average of the share of "poor" in various energy deficit sectors, the weights being the sectors' share in total energy deficit. The PII as worked out for a hypothetical example is illustrated in chapter 3.

The PIR and/or PII would form the basis of project classification depending on the relative importance (in terms of coverage and/ or investment) of the project components for which the two are estimated. If the rural electrification component is a significant part of the project, the PIR could constitute the basis for project classification. However, if it is a relatively small project component, project classification could be carried out on the basis of PII. In the latter case too, the PIR should be calculated because the process of impact assessment provides useful inputs into project design and benefits monitoring.

The above methodology may be applied to other ADB projects in pipeline 2001-03 , as indicated in chapter5.

Enabling mechanisms

In designing a project, its location/area of influence and components, it is essential to take into account the characteristics of the region such as incidence of poverty, level of education, access to modern forms of energy and natural resources, landholding pattern, and major economic activities. Even in an area of high poverty incidence, for energy projects to have significant poverty impacts, several enabling mechanisms need to be in place. Examples of enabling mechanisms that could help ensure that project benefits permeate to the poor include targeted subsidy schemes for families living below the poverty line (for energy tariffs, connection costs and/or equipment costs) and presence of complementary infrastructure/schemes set up by government or non-government organizations (including street lighting, medical facilities, piped water supply or better-equipped schools). The involvement of stakeholders or a 'participatory approach' to project design is necessary in order to identify and strengthen complementary schemes, delivery mechanisms and infrastructure that would maximise the flow of benefits.

In addition to ex-ante analysis, benefit monitoring at various stages of the project and ex-post assessment are also recommended as these would help identify gaps in the project design and implementation, and suggest ways to address these besides offering useful lessons for other projects.

1

Introduction

Background to the study

The Asian Development Bank's Poverty Reduction Strategy (1999) mandated that all energy sector loans[1] aim at the reduction of poverty directly or indirectly. Each loan is expected to contribute to this overarching objective through the three pillars of pro-poor sustainable economic growth, social development, and good governance. To establish the contribution of ADB's operation to these objectives, each loan proposal now explains how its interventions will help reduce poverty. Following the adoption of this strategy, the ADB has reoriented, modified and supplemented its approach in the energy sector towards such themes through its Energy Policy 2000.

Although the current Energy Policy recognizes the links between energy and poverty reduction, it has pointed out that information gaps make it difficult to estimate the absolute or relative welfare impacts of different kinds of energy interventions In fact, energy sector operations[2] have been mostly recognized as contributing to poverty reduction indirectly through their support to economic growth. The direct contribution of ADB's energy projects to poverty reduction has been seldom acknowledged mainly because of the lack of a systemic approach to assess such impact. The bank's IEEN Division has recognized the need to develop a methodology and approach that would enable the poverty reduction analysis of their energy projects. Further, due to an increase in the bank's poverty-related activities, IEEN felt it necessary to develop an approach to enhance their impact. In this context, ADB (IEEN) has undertaken a study to understand the impact of the IEEN's energy projects towards poverty reduction. The study is also expected to identify the poverty reduction potential, direct and indirect, of these projects and suggest procedures for measuring such effects. The ADB has assigned this task to TERI (Tata Energy Research Institute), New Delhi, India.

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[1] This also includes programme and sector loans.

[2] During 1995-99, ADB has provided loans worth US $4.83 billion to the energy sector in various DMCs This corresponds to about 16 per cent of the total lending volume of the bank during the period

Scope of the study

Against the above background, the scope of the study is as follows·

- To establish the link/relationship between energy development and poverty reduction (both at the macro and micro levels).
- To review the existing guidelines, procedure and methodology adopted by the ADB to assess their impact for poverty reduction.
- To develop a detailed evaluation framework to identify and assess the direct and indirect impacts of energy projects on poverty reduction. The framework will include checklists and guidelines for categorising the project as "pro-poor", and poverty interventions, including core poverty interventions.
- To identify and assess the potential of the above impacts (that have direct and indirect impacts on both urban and rural poor) on the basis of the evolved/recommended framework.
- To review Country Assistance Plans (relevant to IEEN), focussing on components which will have poverty reduction impacts
- To suggest alternative and more specific areas on which IEEN projects should concentrate.

Study approach

In order to meet the above objectives, the following methodology was adopted:

- To establish a thorough understanding of the relationship and the links between poverty reduction and energy development at the macro level, a review of the existing studies, reports and other secondary publications was undertaken.
- The existing ADB approaches of designing poverty reduction projects, the method of impact assessment, guidelines and policy papers were reviewed to understand ADB's approach to poverty reduction.
- A field visit to Philippines in the Central Luzon was undertaken in order to understand attitudes, beliefs and perceptions of a cross section of the stakeholders of ADB-supported energy projects.
- Extensive discussions with experts[3] were held both within and outside ADB.
- To ensure that the proposed framework was practical and acceptable, the draft framework was put up for discussion at a seminar[4] to elicit comments, which have been incorporated in this final report.

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[3] See Annexure 1 2

[4] See Annexure 1 1 for the list of ADB officials who participated in the seminar held at the ADB office, Manila on January 19, 2001

Structure of the report

Following this introductory chapter, Chapter 2 provides the background and conceptual framework for analysis of energy poverty linkages. Chapter 3 presents a framework of analysis necessary to assess the poverty reduction impacts of IEEN's energy projects, and Chapter 4 suggests mechanisms to maximize these impacts. Chapter 5 analyses all the major energy projects in the ADB pipeline during 2001-03 against the suggested assessment framework.

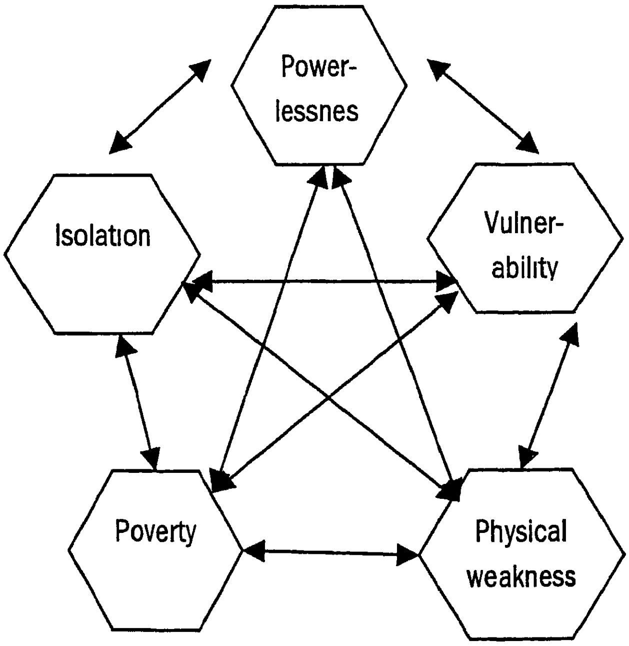
2 Energy and poverty: a conceptual framework

This chapter discusses the concept of poverty and examines how energy projects and programmes could facilitate poverty reduction. Aspects of energy-poverty linkages discussed here lay the foundation for our analysis in subsequent chapters.

Dimensions of poverty

It is now well recognised that income (or the lack of it) is only one aspect of poverty. That poverty is multi-dimensional has been discussed extensively in the existing literature (UNEP 1995, UNDP 1998, ADB 2000, WB 2000a). Poverty, in a wider sense, is deprivation, which may be traced to five interrelated clusters of disadvantages: physical weakness (lack of strength, undernutrition, ill health, disability, high ratio of dependants to active adults); isolation (physical remoteness, ignorance, lack of access to information or knowledge); income poverty (lack of income and wealth); vulnerability (increased exposure to contingencies, danger of becoming more deprived); and powerlessness (inability to cope, adapt and choose) (Chambers 1989)

Figure 2.1 Deprivation trap



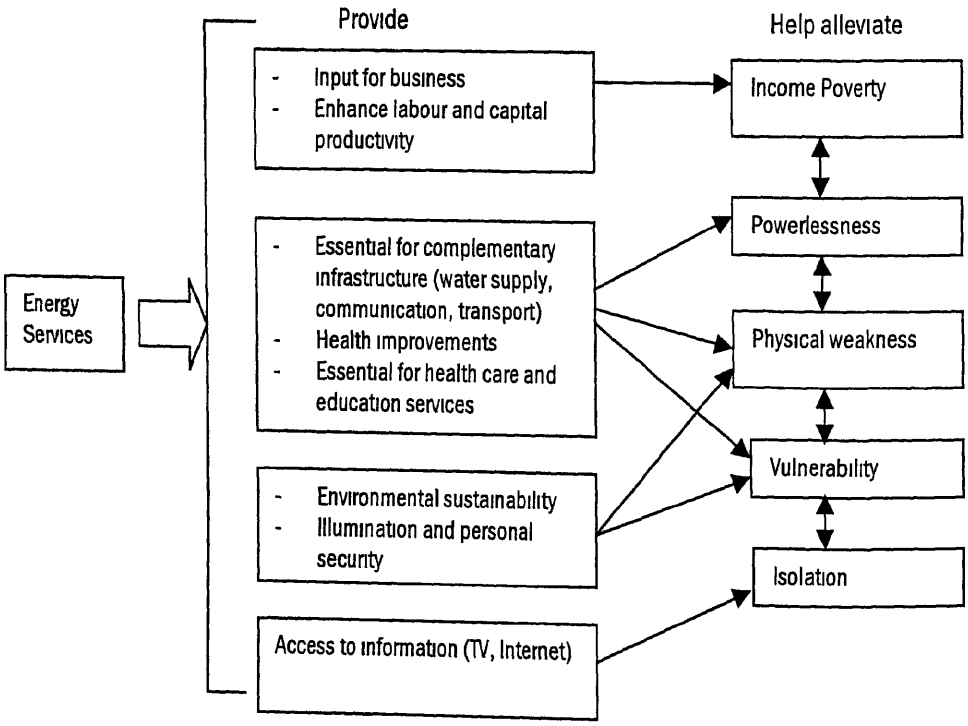
Source Adapted from Chambers 1989

Factors contributing to poverty in a country could be many: lack of employment opportunities among the poor due to slow economic growth or inequitable distribution of the benefits of growth, reduction in stock of or access to natural resources and so on. Economic growth and the distribution of its benefits in a country are constrained by many factors such as macroeconomic instability, low or poorly targeted public spending, global economic pressures, and inadequate technological progress.

Potential of energy in breaking the deprivation trap

Energy has strong linkages with poverty. Energy development contributes to poverty reduction indirectly through economic growth. Energy in itself is a near basic human need depending on its use in a given place Being central to the satisfaction of basic needs like health and nutrition, it has enormous potential in addressing several of the disadvantages that constitute in the deprivation trap (Figure 2.2 and Box 2.1). Energy production and consumption are also inextricably linked with the state of natural resources like forests, on which the poor are directly dependent.

Figure 2.2 Energy services contribute to breaking the deprivation trap


Provide
Help alleviate
Energy Services
- Input for business
- Enhance labour and capital productivity
- Essential for complementary infrastructure (water supply, communication, transport)
- Health improvements
- Essential for health care and education services
- Environmental sustainability
- Illumination and personal security
Access to information (TV, Internet)
Income Poverty
Powerlessness
Physical weakness
Vulnerability
Isolation

Box 2.1 : Field study at Central Luzon, Philippines – Insights into energy-poverty linkages

A field study at Central Luzon, Philippines (October 2000) exemplifies the impact of energy projects on the relatively deprived sections of the population. The prime objective of this study was to probe into the perceptions of a cross section of stakeholders of ADB supported energy projects in Central Luzon Various linkages between energy and the dimensions of poverty became evident in the field, for different economic sectors-residential, agricultural and industrial Most businesses undertaken were found to be dependent on electricity and frequent brownouts disrupted their smooth functioning Brownouts were reported as one of the major problems in areas surveyed leading to loss of productive time, inefficiency and in some cases unemployment A greater proportion of the respondents questioned, revealed that they were willing to pay a higher price for the provision of a reliable source of energy, which were affordable and easily accessible The cost of accessing the modern energy services was reported to be high and a major reason for not using the service despite its availability. The provision of electricity contributed immensely towards enhanced capabilities of poor households as became apparent from the study Usage of higher energy forms reduced indoor air pollution, enhancing the quality of life by curtailing health disorders particularly amongst the women It was found that most women respondents used gas for cooking purposes but expressed their reliance on traditional energy sources in case of non-availability Electricity was important for running health clinics, and helped in the provision of education to children who could otherwise not study during the night A woman respondent from Panelco distribution area (northern Luzon) considered electricity as the basic requirement of her life and mentioned the sense of security it provided The study thus clearly supports the hypothesis that energy-poverty linkages are strong and sheds light on how efficient energy sources can contribute to the alleviation of poverty in all its dimensions (Details of the field study in Annexure 3 4)

For instance, many poor households in developing countries use fuelwood or cowdung for cooking and kerosene for lighting. Access to modern forms of energy such as LPG for cooking or electricity for lighting would ensure better quality of life through reduced indoor air pollution and better lighting, which in turn have positive health impacts. Electric illumination also significantly increases the number of hours poor children are able to spend reading and studying (Foster and Tre 2000). This has positive implications for education and therefore, on employment, resulting in reduced vulnerability. The provision of electricity also opens up a plethora of options for information access such as television and Internet, reducing isolation, and integrating poor and remote villages with the rest of the world.

In broad terms, impact of energy projects may be at the macro or micro level and these impacts may be observed either on the supply side or at the point of consumption (Figure 2.3).

Energy-poverty linkages on the supply side

On the supply side, energy projects/programmes have impacts either at the project site or at a more macro level. At the project site, employment opportunities during construction and operation stages would directly impact income and poverty.

Those in the vicinity of a project are also likely to be affected by the environmental effects during the construction and operation stages of the project. Some environmental threats during the project's construction phase may be temporary, others, however, may have long-term consequences. Common construction hazards identified by ADB include run-off erosion during rains from unprotected excavated areas, contamination of groundwater from construction material, traffic congestion, risk of accidents and spread of communicable diseases from lack of sanitation or respiratory problems due to dust or fumes. Other social problems include displacement of people at the project site and the perpetuation of slums once the construction is over. Environmental and social problems caused during the operation of the project that may be of a more long-term and recurring nature include emission of noxious gases and discharge of effluents.

At the macro level, energy projects contribute to poverty alleviation primarily through resource savings. To illustrate (UNDP 1997):

- Some large energy projects directly generate large scale employment, e g , the programme to produce ethanol from sugarcane in Brazil created 700,000 jobs
- Energy projects that reduce dependence on energy imports would release foreign exchange reserves for other more pressing development needs Similar is the case with energy projects that make it possible for regions to export energy.
- Energy projects that lead to efficiency gains or increased private participation may also make resources available for other needs. Projects that promote efficiency in energy supply may also lower the price of energy making it more affordable. However, for such benefits to flow to the poor, the DMCs will need to have in place pro-poor policies and strategies (discussed in chapter 4).

Poverty impacts of energy consumption

At the macro level, energy consumption indirectly impacts on poverty through the trickle- down effects of growth. Backward and forward linkages of agricultural and industrial expansion facilitated by energy consumption may augment employment and income at various tiers. For instance, growth in the cement sector induced by an energy project has backward linkages with limestone mining and forward linkages with the construction sector.

This economic growth will widen the tax base, which with appropriate revenue collection policies and procedures could support investments in rural schools, hospitals and other basic infrastructure.

At a micro level, energy projects that provide access to energy, increase its reliability, and/or improve its affordability have significant poverty alleviation impacts. Energy consumption in households, agriculture and industry/ commercial sectors directly contributes to improvement of quality of life of project beneficiaries, especially the poor.

Residential sector

Households use energy for a variety of uses: cooking, lighting, water heating, and space conditioning. Energy constitutes a sizeable portion of household expenditure, particularly among poor households in developing countries. Low-income households tend to rely on a significantly different set of energy carriers than do the rich. In India, for instance, biomass fuels are estimated, as meeting over 90 per cent of the energy needs of rural households, and a significant portion of energy needs of lower-middle and low-income urban households. By contrast, richer urban households use LPG, kerosene and electricity.

The provision of superior energy sources like electricity and LPG, have important economic and social implications because of significant adverse effects of the use of traditional fuels in all stages of the fuel cycle (collection, processing and combustion).

The most important characteristic of biofuel use in the rural domestic sector is its informal and largely non-commercial character. In most cases, individual families gather their own supplies from farming areas, common lands or other local sources to which they have access. Fuelwood shortages also sometimes induce households to adopt different kinds of coping strategies. For instance, in the absence of other alternative fuels, households may be compelled to substitute fuelwood with inferior biomass fuels, which lead to increased air pollution, and increased tending time. Or, households may just cook less often

(UNEP, TERI 1999). The urban poor often also pay a high price for fuelwood, which is transacted on a commercial basis in towns and cities.

Another very significant impact of switching from biomass fuels to more efficient cooking fuels is the reduction in indoor air pollution. Health damaging pollutants in biomass smoke from household stoves in India include small particles, carbon monoxide, nitrogen dioxide, formaldehyde, polyaromatic hydrocarbons like benzopyrene and so on. These pollutants are associated with the incidence of acute respiratory infections, chronic obstructive pulmonary disease, lung cancer, tuberculosis, asthma, eye irritation and blindness. From an economic point of view, disease burdens associated with indoor air pollution from traditional bio-fuels may be assessed in terms of person days lost due to ill-health as well as treatment costs averted. The health impacts of indoor air pollution have important gender and long-term implications because women and young children are the most affected due to their predominant household roles (See also Box 2.1).

In the context of lighting, the provision of electricity to poor households gives them access to better lighting. This makes it possible to gainfully utilize the latter part of the day, resulting in positive feedbacks on education and employment. For instance, it may now be possible for children and adults to study for longer hours and for adults (particularly women) to take up activities like sewing, and embroidery (for revenue generation or otherwise). In this way, the provision of new forms of energy, particularly electricity, contributes to enhanced capabilities.

Provision of electricity to a settlement that was hitherto not electrified, also opens up the possibility of providing other social infrastructure which would never have been possible otherwise. These include street lighting, piped water, better equipped hospitals and schools and access to television.

Other more remote, but no less important benefits may accrue indirectly For instance, access to electricity may reduce dependence on fuelwood, which in turn may arrest forest degradation, with positive impacts on land degradation and water depletion.

Box 2.2: Gender and energy

Energy policies and projects are sometimes considered as gender-neutral But they affect men and women differently because of they have very different roles in the household and in the community

Traditional biomass fuels still meet a large part of energy needs in rural households in developing countries and women are primarily responsible for gathering these fuels. With increased deforestation (partly induced by heavy reliance on fuelwood), local wood supplies get scarce, imposing further burdens on women, as they have to make longer journeys with heavier loads of fuelwood, running the risks of spinal column damage and uterine prolapse (UNFPA 2000) Time spent in wood collection and other household chores often leaves little time for productive employment, education and community involvement. Girl children who help their mothers in these activities, are likely to be kept away from school, contributing to the perpetuation of adverse gender-energy-poverty linkages

Smoke from wood and other biomass fuels used for household cooking may be responsible for up to 50 per cent of total human exposure to particulate matter in the air (Smith and Thorneloe 1992) Given that cooking and household chores are primarily done by women, they are exposed to higher concentrations of these particles, making them more vulnerable to respiratory diseases

Consequently, the provision of access to efficient, non-polluting cooking fuels can have significant impacts on women in terms of reduced drudgery, health, education as well as involvement in community activities Access to safe and reliable lighting enhances income-generating opportunities by making it possible for them to engage in informal home-based economic activities All these impacts, collectively, have the potential to uplift women from a state of upliftment on to one of empowerment.

Given the predominant role that women play as collectors and users of household energy fuels, they have tremendous experience and understanding energy-related issues and can play a crucial role in energy management It is, therefore, important that women's needs and priorities must be factored in while designing energy projects (See Annexure 3 2). They must also actively participate in energy-related decision-making – be they on policies, technologies or institutions.

Agricultural sector

Agricultural growth is a pre-requisite for the economic and social development of the country. The sector provides employment to a large share of the workforce and is the primary source of livelihood in rural areas. Performance of agriculture thus impacts poverty eradication directly. Across the developing world, the sector has witnessed rapid growth in energy consumption as agricultural activities have become modernized and mechanized. Direct energy uses range from land preparation, sowing, irrigation, application of fertilizers, harvesting, and transport to agro industries. In addition, energy is also used indirectly for the manufacture of agricultural inputs such as fertilizers, pesticides etc. Despite the growth of on-farm energy use, many areas in developing countries are characterized by lack of sufficient quality energy inputs, mainly electricity, and agricultural practices remain to a large extent based on human and animal power. At the same time, unreliable electricity services have led to high dependence on alternative fuels like diesel for irrigation, which may be less efficient, more costly and environmentally more harmful. Any project that provides incremental or more reliable electricity to the sector may benefit the poor in three ways. First, it may reduce the cost of energy by making available, cheaper, more efficient and convenient options like electricity, thereby benefiting all farmers dependent on groundwater. Secondly, it may cause an increase in the gross cropped area either through an increase in cropping intensity or additional land brought under cultivation. Third, farm employment may increase as the gross cropped area goes up. Thus, not only do the landed poor benefit but also the landless as employment opportunities on the large holdings increase.

Industrial sector

The industrial sector is the largest consumer of energy. The sector uses energy as one of the basic and prime inputs. The setting up of new industries thus may be constrained by inadequate availability of energy or the poor quality of supply These factors may also affect capacity utilization in existing industries. Availability of additional or superior forms of energy in an energy deficit area may foster industrial growth in the region through reduced costs or increased output and employment, that in turn sets off a multiplier effect on output and employment throughout the economy. At the same time, however, as the scale and spread of industrial activity rises, associated environmental risks may get aggravated in the absence of appropriate safeguards.

Transport sector

The transport sector may also gain through energy projects that provide reliable access to modern forms of energy. For instance, provision of reliable power supply will encourage the development of a railway network. This may result in an improvement in the quality of life for local commuters and reduce pollution levels.

Adverse impacts of energy projects

Thus far the focus in this chapter has been on benefits of energy projects. However, these projects may also have adverse impacts – either direct or indirect. Take the case of a hydro power project. Its direct adverse impacts may be displacement of population and inundation. Indirect impacts would be a consequence of expansion of agricultural or industrial activity triggered off by the project. With access to power, more areas in the region may be brought under irrigation and this may be accompanied by an increase in use of fertilisers. Improper irrigation or over-application of fertilisers may cause soil degradation and decline land productivity. Industrial expansion that follows as a consequence of increased energy availability may have adverse environmental and health impacts.

Energy projects that involve relocation and shutting down of industries would lay off people or shift environmental costs from one region to another. While assessing benefits of energy projects, these likely adverse impacts are to be borne in mind. This is particularly important in the context of poverty impact assessment because in such situations – be it displacement or unemployment or loss of property due to inundation – the poor are impacted the most.

Catalysing poverty alleviation through energy projects: identifying and targeting the poor

For energy projects to be poverty interventions, several factors are important.

Typically, energy services are beneficiary neutral: they can equally benefit the rich and the poor. Therefore, for energy projects to have significant impacts on the poor, it is important that they be specifically targeted to these sections of the population. Identification of the "poor" is, therefore, critical to ensuring that benefits to the poor are maximised.

The national poverty line may not be wholly appropriate as a means of identifying poor project beneficiaries. Firstly, it may be difficult to estimate the income of each beneficiary household to assess whether it is above or below the poverty line. Secondly, income is only one of the determinants of poverty. Thirdly, in some countries, there may be no national poverty line and data on household income may be limited or unreliable. Given these limitations, it is necessary to identify "indicators" (or identification marks) of poverty for various categories of project beneficiaries. Those identified as "poor" (Table 2.1) in each category may be seen as being the most income-poor, vulnerable, powerless and isolated.

Table 2.1 Identification of the "poor"

Project beneficiary	"Poor" project beneficiary
Households	Households without access to modern energy forms like LPG, electricity
Farmers	Landless, small and marginal farmers
Employees of industry / commercial establishments	Casual / unskilled labour

Therefore, for an energy project to be a poverty intervention, it must target the "poor". Based on the table above, this could imply, for instance, a preference for projects that target a region with many non-electrified households or projects that employ large numbers of unskilled labour.

For energy projects to be poverty interventions, the policy and institutional context of the area should be pro-poor so that maximum benefits can permeate to the poor. Indicators of pro-poor policies and institutional settings include macro economic stability, government spending on poverty alleviation programmes, tax incidence on the poor, effectiveness of regulatory regimes, asset distribution, voice of the poor in the political process and safety nets (ADB 2001). There is a need to set up project-level and macro-level mechanisms to ensure minimum "leakage" to the non-poor (Chapter 4).

Projects will have to be designed in consultation with project beneficiaries, particularly the most vulnerable groups, and their concerns should be incorporated early in the project planning stage. A participatory approach would be useful to identify the needs of the poor, which the project should seek to address. The participatory study on Power and Poverty in Tajikistan is a good example of how such an approach could be adopted. This study included focus group discussions, small participatory workshops, and detailed planning workshops with stakeholders and beneficiaries. The fieldwork was preceded by the preparation of a poverty profile for the area, based on secondary data (Details in Annexure 3.1).

Energy projects have good potential for poverty alleviation, provided these are targeted at the poor and are accompanied with pro-poor policies. The following chapter presents a framework for ex-ante assessment of the poverty reduction impacts of energy projects.

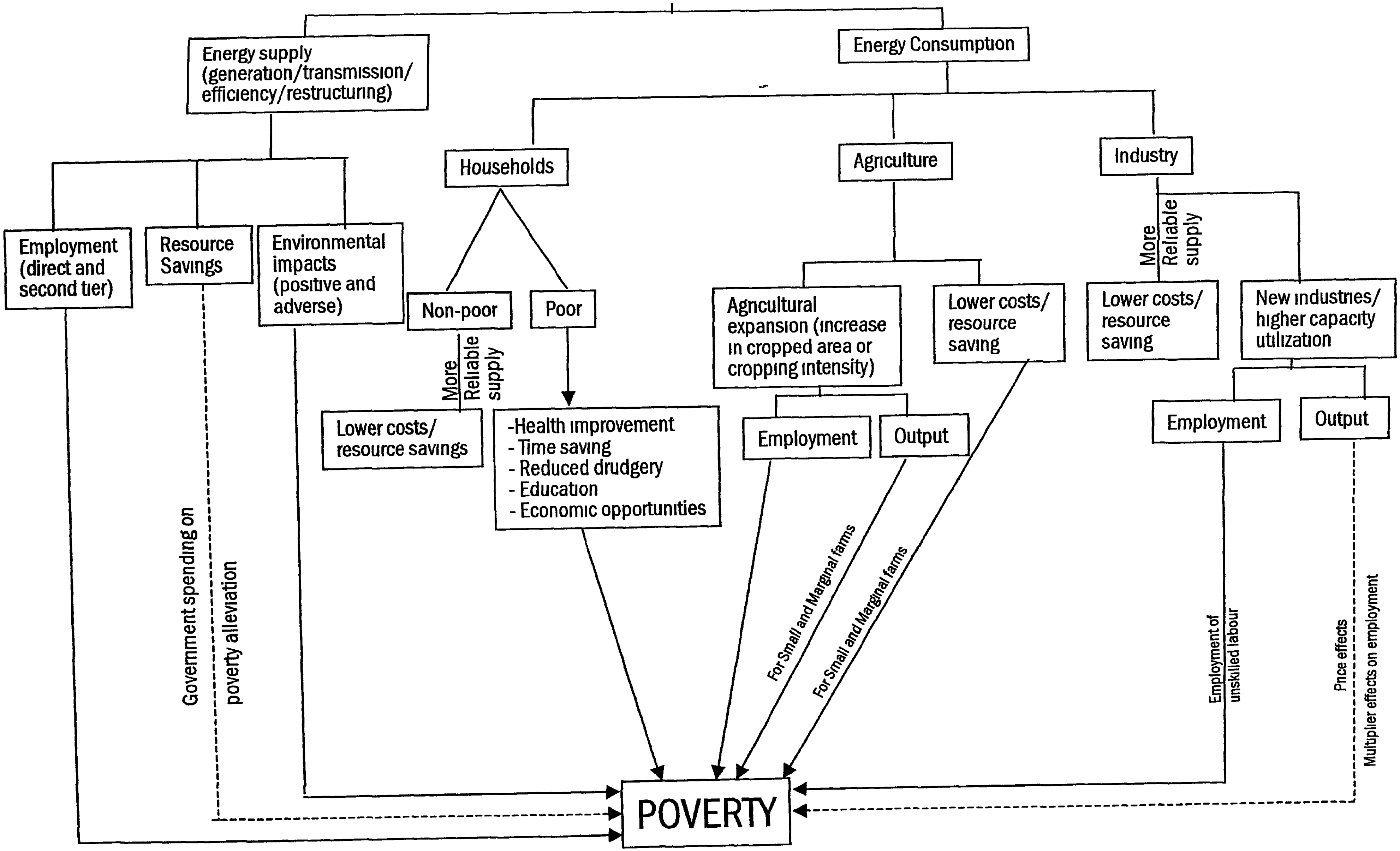

Energy supply (generation/transmission/ efficiency/restructuring)
Energy Consumption
Households
Agriculture
Industry
Employment (direct and second tier)
Resource Savings
Environmental impacts (positive and adverse)
Non-poor
Poor
More Reliable supply
Lower costs/ resource savings
-Health improvement
- Time saving
- Reduced drudgery
- Education
- Economic opportunities
Agricultural expansion (increase in cropped area or cropping intensity)
Lower costs/ resource saving
Employment
Output
More Reliable supply
Lower costs/ resource saving
New industries/ higher capacity utilization
Employment
Output
Government spending on poverty alleviation
For Small and Marginal farms
For Small and Marginal farms
Employment of unskilled labour
Price effects
Multiplier effects on employment
POVERTY

Figure 2.3 Poverty Impacts of Energy Projects

lote: Dotted lines represent indirect impacts

3 Framework for poverty reduction analysis

Based on the energy-poverty linkages discussed earlier, this chapter attempts to develop a framework for analysing - qualitatively and quantitatively- the impacts of energy projects/programmes on poverty reduction ex-ante. It critically examines the current ADB methodology for poverty impact assessment and discusses refinements that better capture some of the impacts on poverty. It needs to be reiterated at the outset, and as the ADB itself recognises, that poverty impact analysis should be considered more than just an exercise for the estimation of benefits. The process towards the estimation of benefits should reveal important policy and institutional initiatives and project design modifications that are required to realise and enhance these benefits.

ADB's energy sector policy

ADB's goal in the energy sector is to increase the availability of energy in a least cost and environmentally friendly manner and to enable access to energy for people in its DMCs, particularly the poor (Energy Policy, 2000). To this end, energy sector operations of the Bank are based on four important themes. These are:

- poverty reduction to be achieved by aligning energy sector projects to the pillars of pro-poor economic growth, social development, good governance and increasing energy access to the poor;
- progressive sectoral policies of attracting private sector investment, thereby enhancing efficiency and allowing governments to release resources for other development programmes;
- provision of clean energy, including renewable energy by introducing or enhancing market based instruments and co-operation between developing and developed countries; and
- regional co-operation and trade by promoting initiatives to develop and use energy resources on a regional scale, thereby leading to economies of scale instrumental for lowering costs.

The Bank is involved in a wide range of energy projects and programmes including generation, transmission/transportation and distribution of energy, fostering structural reforms that encourage the participation of the private sector, efficiency improvements, cleaner technologies and fuels and energy conservation. These projects can have substantial benefits for the poor, as discussed in chapter 2 and depicted in Figure 2.3. While some of these benefits flow indirectly and/or in the long run through economic growth or resource savings, others impact the poor directly by providing them access to modern forms of energy. The next section examines the approach followed by the ADB in estimating these benefits.

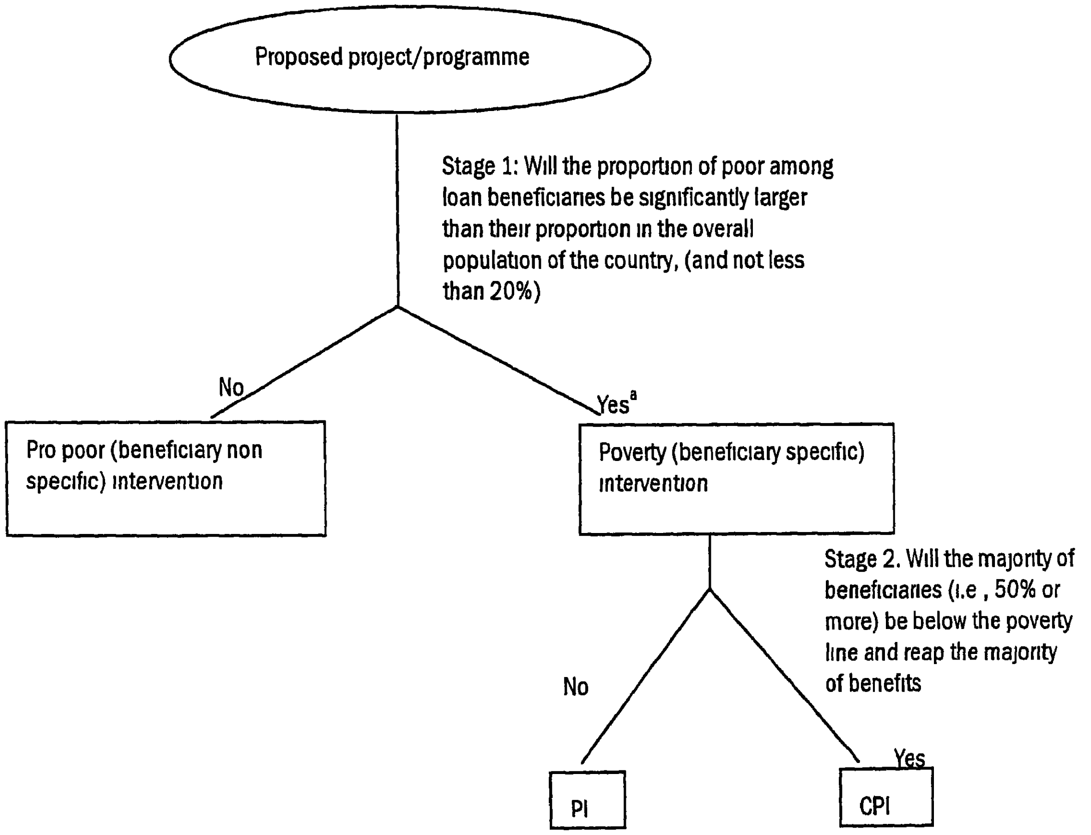
Existing methodology for poverty impact analysis

The poverty reduction strategy of the Bank indicates that all public sector loans will aim to reduce poverty, directly or indirectly, such that not less than 40% of lending volume should contribute to PI (poverty interventions), including CPI (core poverty interventions). The difference between poverty interventions and other ADB projects and programmes lies in the manner in which these contribute to poverty reduction. whereas 'poverty interventions' would have clear poverty reduction impacts, in the case of other interventions, the impacts on poverty though real may not be immediately obvious (Loan Classification System, 2000). Classification of a project/programme as PI or otherwise is hence to be based on an assessment of distribution of benefits.

The methods for anticipating effects and measuring impacts of loans on the poor include quantitative and qualitative approaches, which complement each other. Qualitative methods employed include problem tree analysis and logical framework, and are aimed at clearly charting out impact of energy interventions in poverty reduction. These tools are also useful in identifying policies and institutions that would foster or hinder the flow of project benefits to the poor

The 'quantitative analysis' for measuring benefits and poverty impact is based on PIR (Poverty Impact Ratio) as detailed in Appendixes 25 and 26 of the Guidelines for Economic Analysis (1997) and discussed briefly here The PIR and proportion of poor in project beneficiaries constitute key elements in the Bank's classification system. Projects are classified as a) projects with poverty (beneficiary specific) intervention, or b) pro-poor (beneficiary non-specific) interventions. For a PI (poverty intervention) project, the proportion of poor among loan beneficiaries should be significantly higher than their proportion in the overall population of the country, and in no case less than 20 per cent Once a loan is classified as PI, it may fall into the subcategory of core poverty intervention (CPI), if the majority of the loan beneficiaries are below the poverty line and reap the majority of the project benefits. The Bank's classification scheme is depicted in Figure 3.1 below.

Figure 3.1. Project classification's 'Decision Tree'


Proposed project/programme
Stage 1: Will the proportion of poor among loan beneficiaries be significantly larger than their proportion in the overall population of the country, (and not less than 20%)
No
Yes[a]
Pro poor (beneficiary non specific) intervention
Poverty (beneficiary specific) intervention
Stage 2. Will the majority of beneficiaries (i.e , 50% or more) be below the poverty line and reap the majority of benefits
No
Yes
PI
CPI

[a] In cases where the loan beneficiaries are not readily identifiable, but where qualitative assessment clearly indicates that a significant

The Bank guidelines also require that non-PI/CPI loans should have real impact on poverty. These are required to be demonstrated by explaining how economic growth will generate spin offs that are relevant to and inclusive of the poor. Such an explanation should also provide logical and well founded arguments that illustrate how income generating or other efforts of the loan will reach the poor.

Qualitative approach: review and recommendations

Qualitative methods for assessment of poverty impact of energy projects entail an illustration of energy-poverty linkages in the specific context of the project area of influence. Given that projects have immediate effects and impacts, it is necessary to trace the flow of the immediate effects of energy projects (in terms of changes in physical access to energy, reliability of supply, affordability or efficiency and environmental improvements at the supply end) to see how these would translate into impact on the poor.

The Bank lays down guidelines for social analysis of projects, which include assessments of: (a) groups who are expected to benefit from and use services provided by the project, (b) needs of these groups, (c) their demands, (d) their absorptive capacities, (e) gender issues, and (f) possible adverse effects on vulnerable groups.

These guidelines are extensive, but need to be modified/customised to serve as inputs into poverty impact assessment of energy projects/programmes. Taking into account energy-poverty linkages discussed in chapter 2, the recommended approach is as follows:

1. Preparing a poverty profile of the project area of influence

This would involve collection of poverty related data, once the project sites/areas of influence are finalised. While some of this data may be available from secondary sources, others may have to be estimated through field surveys Reference to this concept has also been made in the Bank's (Draft) *Handbook for Integrating Poverty Impact in Economic Analysis of Projects* (January 2001).

A poverty profile, specifically in the context of an energy project/programme should include the following:

- Income and wealth: average per capita income, proportion of households below the poverty line, land-holding, cropping patterns, level of agricultural income; level and pattern of industrialization, capacity utilization and employment in key industries; wages for skilled and unskilled labour
- Energy
  - In households: current fuel use pattern for cooking, heating, lighting and space conditioning; focus on extent of dependence on biomass fuels; estimates of indoor air pollution (concentration and exposure)
  - In agriculture. use of electric and diesel pumpsets for irrigation; extent of use of electricity for other agricultural activities;
  - In industry. Energy use per unit of production in key industries; reliability of supply (production time lost, self-generation, reserve margin)
- Expenditure on energy: by various categories of households, farmers and industries

- Access to infrastructure: roads, education and health facilities, safe drinking water, telecommunications, TV/broadcasting, markets.
- Demographic: rural/urban composition, fertility, mortality, migration, and literacy.
- Health: incidence of air and water-borne diseases
- Institutional aspects: participation of the poor and illiterate in the local decision-making process; governance (including pro-poor laws and policies); access to micro-credit
- General macro-economic health (of the province or country): GDP growth, inflation, percentage of poor, average per capita income.

The objective of this exercise is to assess the current status of the project area in terms of extent and nature of poverty in all its dimensions.

2. Identification of affected groups of population, and the most vulnerable classes in these groups

This is relatively simple for specifically targeted projects/project components like rural electrification, power distribution projects or decentralised renewable energy projects. For others such as power generation projects, there is a need to identify areas that are likely to get additional or improved quality of energy because of the project.

It is also important to identify the most vulnerable classes among those affected. These would include, *interalia,* households below the poverty line, those without access to modern energy forms, those who do not own any assets, particularly land, and unskilled labour (Table 2.1).

Several groups are also likely to be adversely affected by certain components of energy projects – generally by way of displacement or loss of employment or property. These groups need to be identified; appropriate and adequate compensation must be worked out in consultation with them and these compensation costs and mechanisms are to be factored in early in the project planning cycle.

3. Needs assessment and problem tree analysis

The poverty profile will provide useful inputs in assessing the needs of the people. The Bank discriminates between objective needs and felt needs of the people A poverty profile drawn up on the basis of secondary data can at best reflect the objective needs of the people.

Assessment of real (or felt) needs calls for a structured approach. First a "problem tree" may be drawn up based on past experiences and secondary studies. A problem tree is a graphical representation of the problems faced by a community and causes thereof. The problem tree could then be modified in consultation with local communities. The participatory approach would (see Annexure 3.1 for details) involve discussions with the local community not only on their day-to-day problems, but would also require survey staff to explain how energy could link up with other factors, such as provision of safe drinking water, to solve some of their problems. This approach will also help identify supporting infrastructure/schemes required for the energy project to be effective in addressing poverty in all its dimensions. An indicative ToR (terms of reference) for conducting a participatory study for energy projects is provided in Annexure 3.3. The perception of women should be especially incorporated An indicative ToR for assessing the perception of women on the design of energy projects is indicated in Annexure 3.2.

4. Objective tree analysis: tracing the effects and impacts of energy projects

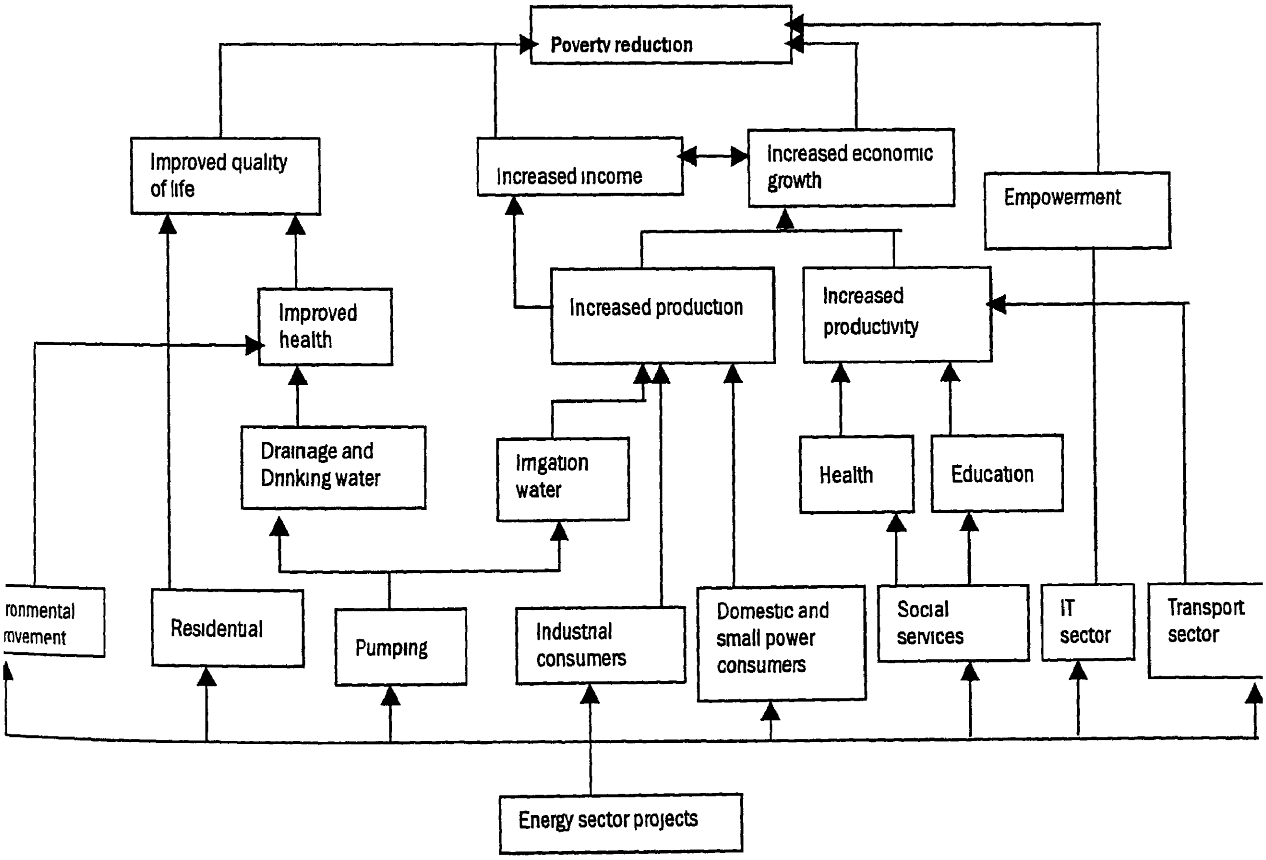
Under the existing guidelines, all projects, at the start of the project operation cycle, are required to prepare an objective tree on the basis of cause-effect relationships in a way which can lead to a strategic solutions to issues being studied. The problem tree and the objective tree are closely linked. While the former attempts to identify local problems and trace their causes, the latter charts out the immediate effects (in terms of services provided) and the impact of energy projects in breaking the "poverty trap" (See also Figures 2.1 and 2.2) and addressing the problems specific to the project area. The problem tree and objective tree analyses have been detailed in Appendix 2 of the *Handbook for Incorporating of Social Dimensions of Projects* (May 1994).

Since energy projects are required to now address the issue of poverty reduction, it is recommended that the project officer constructs an objective tree to trace the poverty reduction potential of the project. An illustrative tree is shown in Figure 3.2.

In the case of a power transmission or a generation project, for instance, the objective tree would identify the different beneficiaries of the project. There could be at least two types of beneficiaries: direct tier 1 beneficiaries and indirect tier 2 beneficiaries. Tier 1 beneficiaries are those physically connected to the project (e.g., residential consumers). The benefits to hitherto non-electrified households (now possibly dependent on fuelwood for cooking and kerosene for lighting) could be quite substantial as discussed in chapter 2. These households could save time and generate additional income[5] as a result of the project. There would also be indirect benefits in terms of reduced pressure on forests (due to lower dependence on fuelwood) and also higher productivity per household (due to savings in cooking time if electricity is used for cooking, and more effective utilization of evening hours because of availability of electric illumination).[6] For households that already have access to electricity, the benefits are incremental in terms of access to more reliable supplies and hence reduced dependence on alternatives like diesel generators.

Tier 2 beneficiaries are those who benefit through employment generated by industry, commerce, agriculture and other sectors which directly use the electricity from the project. Through the objective tree, it would be possible to trace further tiers of beneficiaries, resulting from the forward and backward linkages of industrial or agricultural growth.

Figure 3.2 Energy sector projects and poverty reduction: objective tree



Source Adapted from ADB's Tajikistan Study[7]

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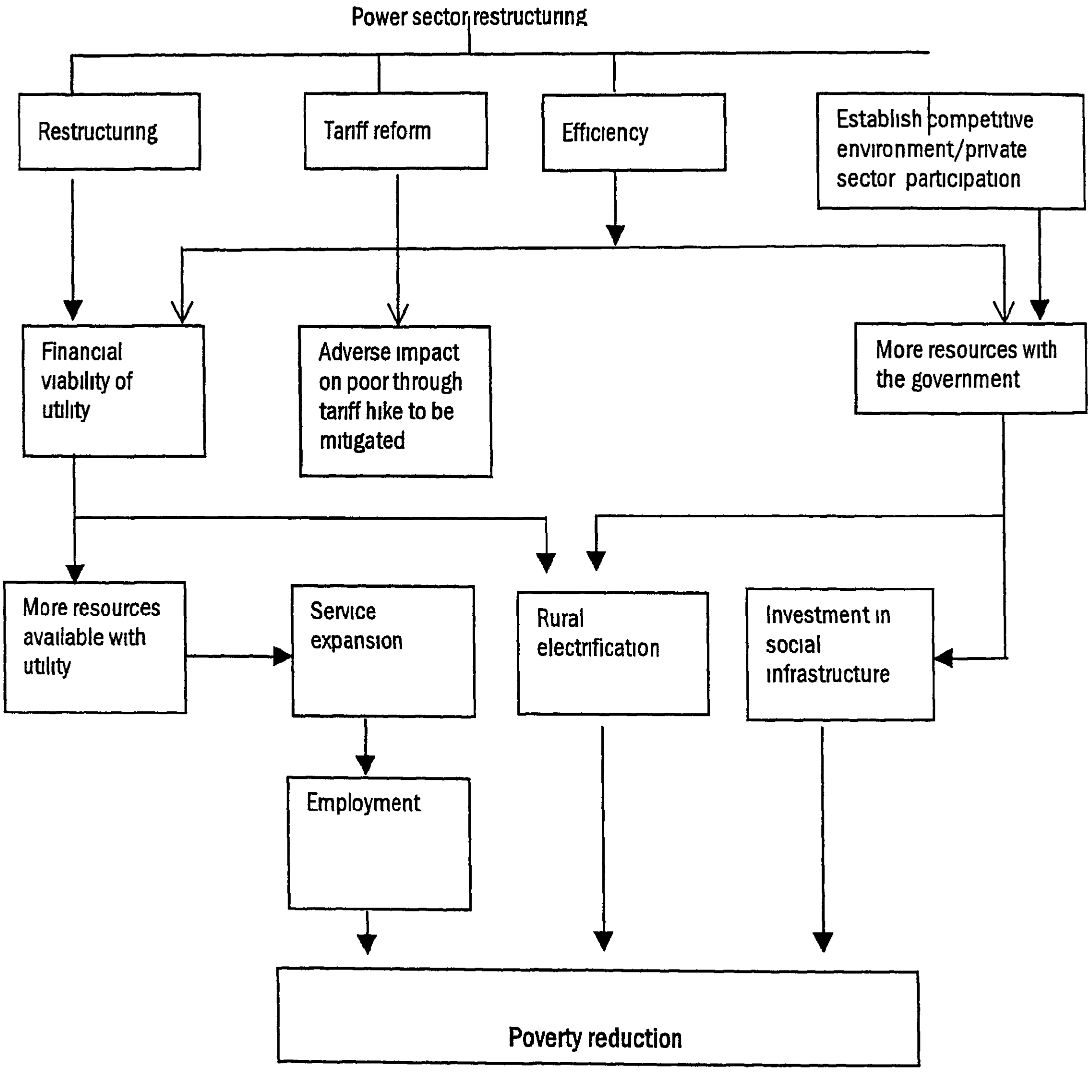
[5] For details see the Philippines field study (Annexure 3.4).

[6] For details see the Philippines field study (Annexure 3 4).

[7] TA 5894.REG· Facilitating capacity building and participatory activities

The objective tree may be equally relevant for energy programme loans such as tariff reform, efficiency improvements, and utility restructuring. An illustrative objective tree showing possible links between a power sector restructuring programme and poverty reduction is shown in Figure 3.3. It indicates how the various programme loan components are likely to address poverty reduction in the sector. Stakeholders' view of the impact of the programme loan should be assessed through the participatory approach at the national, regional and select local levels. These responses are to be incorporated into the objective tree.

Figure 3.3 Energy sector programmes and poverty reduction objective tree


Power sector restructuring
Restructuring
Tariff reform
Efficiency
Establish competitive environment/private sector participation
Financial viability of utility
Adverse impact on poor through tariff hike to be mitigated
More resources with the government
More resources available with utility
Service expansion
Rural electrification
Investment in social infrastructure
Employment
Poverty reduction

Quantitative approach: review and recommendations

Distribution analysis and PIR (poverty impact ratio)

The Bank has extended the standard economic analysis of projects to incorporate an assessment of impact on poverty. This requires first a distribution analysis- estimating the income effects of a project for various groups (consumers, government/economy, and labour) that gain or lose through the project and second, a poverty impact analysis in which the proportion of each group's gains or losses that go to the poor are estimated. Briefly, the first step is to estimate the present value of net financial benefits by stakeholder category. Next, the difference between net economic and financial benefits are added to the financial benefits for each group to arrive at the distribution of the net economic benefits by different groups. Finally, the net economic benefits accruing to the poor are estimated according to the proportion of poor in each group. The sum of benefits going to the poor as a proportion of the total net benefits is termed the "Poverty Impact Ratio" (PIR). The method as detailed in Appendix 25 and 26 in "*Guidelines for the Economic Analysis of Projects*" has recently been applied by the IEEN to two projects to determine whether they fall under PI or CPI[8].

The method, though a useful extension of economic analysis for projects, is based on some simplifying assumptions and tends to overlook some important benefits and costs to the poor.

For the consumer category, for instance, economic assessment is based on the "willingness to pay (WTP) concept" estimated using the value of the most likely or next best alternative available for consumers. In the case of electricity for example, the WTP would be based on the weighted average value of costs (of alternative fuels) of different electricity user categories such as industry, households and agriculture. Unless these consumer categories are further sub categorised by income classes, this average may not reflect the true WTP by the poor. This is because the relatively better off use fuels for which a market exits while typically there would be no markets for fuels used by the poor. Further, use of traditional fuels is associated with implicit time and health costs, which may not get adequately reflected.

The other issue is that of establishing the implications on poverty of changes in general government income/expenditure. The Bank recommends that marginal government expenditure be treated distribution neutral i.e. the poor will share in net government benefits in direct proportion to their share in GDP (ADB 2001). The share thus derived be unduly affected by income inequalities and fail to capture governments' pro-poor policy orientation.

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[8] Power Transmission Interconnection and Reinforcement Project in Philippines (RRP: PHI 29505, May 2000) and Power Rehabilitation Project in Tajikistan (Loan No. 1817 TAJ)

ADB's current methodology also does not fully account for some non-income benefits to poor (e.g. health impact), or some indirect income benefits (e g. time saved, additional agricultural or industrial employment due to increased availability of energy in the sector).

It is recommended that the Bank's assessment framework be modified to address such concerns and better integrate costs and benefits of energy projects to the poor as have been identified in chapter 2. The framework suggested below draws on current PIR methodology used by the ADB, but is a refinement in that it attempts to capture some of the non-income and indirect impacts that the current method does not.

Recommended quantitative framework for estimation of benefits

As discussed in chapter 2, project/programme benefits may flow to the poor directly or indirectly at the supply end or consumption end. The estimation of these benefits is discussed below.

Benefits at the supply end

On the supply side, energy projects/programmes can contribute to poverty alleviation indirectly by fostering macro economic growth or resource savings Energy projects will also have direct impacts on the poor by creating employment at the project site. Those in the vicinity of a project are also likely to be affected by the environmental effects of the project.

Macro economic impacts of energy projects at the supply end

Likely macro economic impacts of energy projects are discussed in chapter 2. While several of these benefits such as the backward and forward linkages of the project are difficult to quantify, it is possible to quantify others such as resource savings to the government (possibly on account of energy efficiency gains); forex savings/earnings and increase in tax revenues due to employment, and income generated by the project. Such impacts are in the nature of increased monetary flows into the government exchequer. While these flows may be taken as the total macro economic benefit of the project (B_1), that part of the benefit which accrues to the poor may be assessed using the percentage of government spending on poverty alleviation (through health, primary education, water supply and sanitation projects as well as employment schemes and rural development programmes). Benefits accruing to the poor may be termed B_{1P}.

Impacts specific to the project area

Other supply end benefits are localised and often confined to the project's area of influence.

The construction of projects and their operation offers substantial employment opportunities, especially to unskilled labour in the region (the impact would be reverse if the project entails the shutting down of a plant). On the other hand, large energy projects often impose high environmental costs, which may affect the poor in a disproportionate manner. Environmental hazards associated with project construction and operation need to be internalised in project design and appropriate safeguards built in. The Bank already has guidelines for environmental assessment for all types of projects including energy projects and is in the process of preparing more detailed guidelines[9]. It has identified potential environmental and social impacts of hydroelectric plants, thermal power plants, and transmission projects and has also recommended mitigation measures that need to be built into the project design. In the case of displacement of people, rehabilitation costs need to be accounted for in the project costs. The EIA (Environment Impact Assessment) should also ensure design of effective and efficient mechanisms so that compensation paid to the displaced reaches them and is adequate.

Social costs nonetheless caused by an energy project, such as health costs due to emissions from a thermal power plant should to be estimated. It is suggested that simulation models reporting changes to ambient air quality for the area surrounding the plant be developed. This, in some sense, is already required by the Bank's environmental assessment guidelines that require a rigorous evaluation of a project's environmental risks and impact in the area of influence. 'Dose response functions' for health and welfare impacts can then be used to quantify impacts, which can then be valued using the cost of illness (Box 3.1). The share of the poor in the social costs can be estimated using the percentage of poor in the region.

The main impacts on poverty during project construction (one time impacts) and operation (impacts to be annualised and estimated over the lifetime of the project) can be valued as follows:

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[9] Environmental Guidelines for selected infrastructural projects, ADB 1993; Environmental Assessment Guidelines (draft), ADB April 2000

- Employment benefits: employment provided (or lost as in the case of shutting down of inefficient plants) may be valued at the weighted average of shadow wage rates for various labour categories. The share of the poor in total employment can be estimated from the share of unskilled labour valued at the shadow wage rate for unskilled/casual labour.
- Health costs: Health costs due to changes in environmental quality may be valued using the cost of illness approach as discussed above. The share of the poor in the total environmental costs is reflected by the share of the affected population living below the poverty line. This may be an underestimate in that the poor, being more vulnerable are affected disproportionately. This method may also be used to estimate environmental costs averted for projects that entail closing down of inefficient plants or introduction of cleaner technologies.

Employment benefits net of environmental cost constitute the impact during the construction and operation stages (B_2: total and B_{2P}: poor)

Benefits at the consumption end

Energy is one of the essential requirements for meeting basic human needs as also one of the key inputs for socio-economic development. Hence, the provision of energy impacts poverty reduction directly and through an indirect macro economic trickle down effect. Valuation of benefits of energy use, particularly to the poor in various economic sectors is discussed below. It needs to be pointed out at the outset that some of the most important benefits of energy services may be intangible and hence difficult to place a value on. Similarly, energy consumption in the transport sector will have indirect impacts on poverty, which being difficult to estimate have been left out of the current analysis.

Residential sector

Provision of modern forms of energy such as LPG and electricity has important economic, nutritional and health implications for households that do not have access to these energy forms and are dependent primarily on traditional bio-fuels for cooking and kerosene or candles for lighting. For the purposes of poverty impact assessments, these households may be categorized as "poor" (See Table 2.1).

Important quantifiable benefits of providing such households with access to efficient and less polluting fuels may be estimated and valued as follows:

- *Savings in time/money* spent in gathering traditional fuels may be captured by the value of traditional fuels replaced. In the absence of realistic economic value estimates of such fuels (values that reflect the ecological and social costs of these fuels), the price of these products at the nearest market may be used (which would atleast capture the value of time spent in collection).
- *Time saved* in cooking, on account of use of more efficient energy carriers, may be valued using the shadow wage rate.
- *Health costs* of indoor air pollution averted would feature as a significant benefit too. Health risks or likelihood of various diseases may be estimated using dose response functions, given pollutant concentrations and exposure. Health costs may be valued using the cost of illness approach. (Box 3.1).

Total benefits to poor households (BHP) may be estimated using the components described above. For other "non-poor" households, which already have access to these fuels, the Banks' energy project may just increase reliability or quality of supply. For these households, benefits may be valued using the expenditure on alternative or back-up fuels. For instance, in the case of an energy project that reduced frequency of power cuts faced by non-poor households, the benefits of the project may be estimated by the savings in expenditure on backups such as diesel generators. Total benefits in the household sector (BH) would, therefore, be the sum of net annual savings by poor and non-poor households. Data requirements for assessment of impacts and potential data sources are shown in table 3.1.

It needs to be reiterated here that the use of new fuels by households entails some fixed and variable costs. In the context of the provision of electricity, fixed costs would include investment in wiring, meters, and electric appliances. Variable costs would include fuel and other operating and maintenance costs. To meet these costs, very poor households may require assistance in the form of credit and lifeline tariffs. Benefits from the use of electricity could be enhanced through provision of other energy-related services, which may require additional investments in infrastructure, as in the case of piped water or street lighting. Unlike schemes targeted for the poor, benefits from investments in social infrastructure would benefit the poor and non-poor alike.

Box 3.1 Assessment of health impacts

Several methods have been explored to value the health effects of local air pollution These include the direct application of stated preference or revealed preference valuation methods and indirect valuation methods using the dose response function.

Direct valuation methods rest on the respondent's awareness of the issues being valued health impacts of air pollution. In the context of developing countries, more so in rural areas, awareness about such health impacts and consequent costs may be low For example, costs of health care borne by the public sector may not be reflected in individual WTP (Willingness to pay).

An alternative indirect valuation method uses the dose response function which involves estimating physical or medical relationships linking environmental variables such as ambient concentrations of air pollution to observable health effects. Dose response functions have been estimated for such health impacts as respiratory hospital admissions, restricted activity days, minor restricted activity days, eye irritation and so on Given the size of a population at risk and the concentrations of pollutants to which this population is exposed, the number of health events due to poor air quality can be determined using these dose response functions.

There are uncertainties in applying dose response functions formulated for developed countries, to developing ones The estimates derived are likely to be conservative given the lower standard of living, nutrition, and health in developing countries, there is a higher percent of the population in marginal health, which would be more susceptible to negative health impacts from air pollution (Brandon and Hommann *et al*, 1995).

One of the methods of the valuing morbidity effects, is the cost of illness (COI) approach, which uses estimates of the social costs of medical treatment and lost output These comprises the sum of direct costs (hospital treatment, medical care, drugs and so on) and indirect costs, which is the value of output lost, which could be calculated using the shadow wage rate and the number of working hours/days lost The fundamental criticism of COI estimates is that they do not reflect the willingness to pay to avoid health damages COI will underestimate WTP because it fails to account for the disutility of illness

- Based on Calthrop, Maddison (1996)

Agricultural sector

Provision of incremental or more reliable energy for agriculture in an energy deficit area may benefit the poor by reducing energy costs, by increasing production (by increasing cropping intensity or net area under cultivation) and by increasing farm employment. These benefits may be valued as under.

- Reduced energy costs: Net savings due to the use of the new form of energy may be valued at the market price of the fuels.
- Increased value added: Incremental value added on all landholdings arising out of an increase in gross cropped area (due to increase in cropping intensity or additional land under cultivation) can be estimated at market prices of output and inputs
- Employment benefits: Employment benefits can be estimated using employment norms for the principal crops along with the increase in gross cropped area using the shadow wage rates

Of the total benefits (B_A), the share of the poor (B_{AP}) would be reflected by the savings or value added on marginal and small holdings and the employment created on large land holdings.

The estimation of these benefits would require substantial data to be collected either through primary surveys or be based on secondary information.

Data would also be required to cross-check availability of other inputs like water that support additional agricultural production. Estimation of value addition may be based on prevailing output and input prices on the assumption that addition to output and additional use of inputs are too small to affect prices, or that there are standard support prices set by governments both for agricultural input and output. Data requirements are listed in table 3.1.

Industrial sector

Industrial expansion induced by additional availability of energy would benefit the poor by creating employment directly or through multiplier effect. Industrial growth may also aggravate environmental risks in the absence of appropriate safeguards.

It may be difficult to estimate the total employment or income benefits of energy use in any one industry given the backward and forward linkages in the economy. Hence, in quantifying these impacts, the analysis is restricted to the tier 1 beneficiaries. If energy is found to be the main constraint to industrial expansion in the region, the resulting employment and income benefits of industrial growth can, as a simplifying assumption, be attributed to the energy project. In the case of existing industries, employment generation will be negligible if the energy provided by the new project replaces captive generation. However, if the project improves capacity utilization in existing industries by making extra shifts possible, there may be employment gains. Employment gains will be even more substantial if new industries, especially those employing a large number of unskilled labour come up as a result of the energy project Benefits may be estimated as under.

- Increase in employment in existing industries: It can be estimated by the employment potential of improved capacity utilization (using the number of additional shifts possible/additional hours of operation and labour requirement per shift) valued at the shadow wage rate. The share of unskilled labour in the total would reflect the benefit to the poor.

Similarly, if new industries are foreseen as a result of the energy project, the employment potential for various categories of labour can be estimated and income benefits calculated using the shadow wage rates.

Total employment gains would constitute total benefits (B_I) while increase in employment of unskilled/casual labour would comprise benefits to the poor (B_{IP}).

The required data to estimate the employment gains would need to be gathered from primary surveys or secondary information. In addition, data would also be required to ascertain the availability of other inputs including land for increased production because these may constrain industrial development despite the provision of additional energy. The data requirements and likely sources are listed in table 3.1 below. An indicative ToR for field surveys for impact assessment and inputs into project design is provided in Annexure 3.3.

Table 3.1 Data requirements and likely sources

Indicator/ Parameter	Data sources				
	Validation by experts	Price surveys	Household surveys	Industry surveys	Secondary information
Industries					
Main industries in the region (large and small scale)					✓
Energy intensity of main industries					✓
Whether energy supply is a constraint				✓	✓
Possibility of new industries					
Employment pattern in existing and new industries				✓	✓
Capacity utilization in existing industries				✓	✓
Capacity utilization in similar industries in other regions where energy supply is not a constraint					✓
Availability of other inputs including raw materials, skilled labour and land					✓
Wage rates of skilled and unskilled/ casual labour		✓			
Possibility and number of additional shifts if power is made available				✓	
Employment per shift				✓	
Agriculture					
Landholding distribution					✓
Main crops grown and yields					✓
Prices of main crops		✓			
Cropping intensity of main crops					✓
Possibility of increasing cropping intensity	✓				✓
Input (fertilizer, pesticide, labour, water etc), use norms per hectare for main crops	✓				✓
Input prices		✓			
Level of water table (to study if more extraction is possible or desirable)	✓		✓		✓
Cost of running diesel pumps			✓		
Cost of running electric pumps			✓		
Net sown area			✓		
Number of crops grown in a year			✓		
Cropping intensity on the farm /part of it			✓		
Main energy source used to draw water electric/diesel/both			✓		
Reason for using diesel/both			✓		
Willingness to use electricity if it is made available			✓		
If electricity is used, will it replace diesel on existing sown area			✓		
Likelihood of cropping intensity or area under			✓		

Indicator/ Parameter	Data sources				
	Validation by experts	Price surveys	Household surveys	Industry surveys	Secondary information
cultivation increasing on account of electricity supply					
Allied activities that electricity can be used for			✓		
Time and cost savings from using electricity for allied activities			✓		
Households					
Time savings from using new fuels			✓		
Cooking time saved due to use of new fuels			✓		✓
Cost savings from using new fuels		✓	✓		
Concentration of pollutants in solid fuel smoke					✓
Dose response functions for various diseases					✓
Treatment costs of various diseases		✓	✓		✓
Number of working days lost due to various diseases		✓	✓		
Shadow wage rate		✓			✓

Incorporating sectoral analysis in poverty impact assessment of projects

The total benefits of a project can be estimated by the sum of net benefits during the project construction and operation stages, and as a result of energy consumption in households, agriculture and industry/commercial sectors. Similarly, the total benefits of the project accruing to the poor can be estimated by the sum of the net benefits to the poor at various stages. The PIR would then be the ratio of the benefits to the poor to total benefits.

Calculation of PIR

The PIR can be calculated by using the above framework as follows:

I Macro benefits at the supply stage
Total: B_1
Poor: B_{1P}
II Environmental costs/benefit as well as employment loss/benefit at the stage of construction and operation
Total: B_2
Poor: B_{2P}

III Electricity consumption benefits in residential, agricultural and industrial/commercial sectors:
Total: B_3 = NPV of ($B_H + B_A + B_I$) over the lifetime of the project
Poor: B_{3P} =NPV of ($B_{HP} + B_{AP} + B_{IP}$) over the lifetime of the project

(B_H denotes benefit in household sector; B_A, the benefit in agricultural sector; and B_I, benefits in the industry sector. The subscript p denotes benefits accruing to the poor)

The PIR defined as the ratio of the benefits accruing to the poor to the total project benefits would be given by:

$$PIR = \frac{B_{1P} + B_{2P} + B_{3P}}{B_1 + B_2 + B_3}$$

Chapter 5 illustrates the application of this methodology to the Shen Da system improvement and electrification project (PRC).

Recommended methodology: review and limitations

The PIR calculated above differs from the existing practice as applied recently in IEEN's two energy projects[10] in terms of both the coverage of benefits and the method of estimation. The suggested methodology covers more benefits, direct and indirect. However, due to practical problems some important benefits have been left out of the analysis. In the household sector, benefits such as increased capability due to enhanced education and employment opportunities arising out of provision of modern energy forms and the resulting income security, have not been captured. In the case of health costs too, the inconvenience/discomfort caused by ailments may not be reflected in the recommended cost of illness approach. Similarly, in the case of employment benefits in the industrial/ commercial sector, the method covers only the first tier employment gains: the multiplier effect on employment is not captured. The methodology also attributes the entire employment gains to increased energy availability/ consumption, though this would require increase in all other inputs including raw materials and infrastructure. Finally, the PIR as estimated in the above manner, would understate the share of benefits going to the poor, the marginal utility of income being higher for the relatively poor.

Discussions on 'best practice' evaluations indicate that stronger evaluations often combine various methods to ensure robustness and to provide for contingencies in implementation. Joining a 'with and without' approach (wherein a random sample of respondents with and without benefit of the intervention are interviewed at the same point of time, and benefits of the intervention isolated through advanced analysis techniques such as multivariate regression) with a 'before and after' approach (that uses baseline and follow-up data for both the 'treatment' and 'control' groups) is one such combination strongly recommended from a methodological perspective (Subbarao et al. 1999). However, in the case of ex ante assessment, the "before and after" approach is clearly not applicable. The "with and without" approach may be used in cases where it is possible to identify a region with a similar energy project and with similar agro-ecological and socio-economic characteristics. Identifying such a truly 'comparable' region though difficult, is not impossible. In such a case, surveys would need to be carried out in both regions, and then, a comparison made to assess likely impacts of the proposed intervention.

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[10] Power Transmission in connection and Reinforcement Project in Philippines (RRP PHI 29505 May 2000), and Power Rehabilitation Project in Tajikistan (Loan No 1817 TAJ)

Irrespective of whether the project team opts for the suggested methodology or the "with and without" approach, qualitative impact assessment through literature review and more importantly, participatory surveys, is always to be underscored. Such exercises provide very useful insights into the processes and interventions that yield and maximise poverty reduction outcomes.

Design of surveys in poverty impact assessment

Poverty impact assessment using the methodology requires extensive, reliable data, most of which would need to be collected through primary surveys of households, farmers, industrialists, medical professionals and labourers.

The objective of the exercise being the assessment of project impacts on the poor and non-poor, it is imperative that the sample adequately represent all income classes In the case of households, the sample would need to include households with and without access to modern energy carriers. While assessing impact in the agricultural sector, landholdings–large, small, marginal–could be the basis for categorizing farmers (these would include landless farmers too). In the case of industry, employment generation is taken to be the most important impact and this could be studied in terms of employment of skilled and unskilled (casual) labour.

The survey could also serve as an important input for project design. For example, the survey would reveal whether the project would meet the energy demand from various sectors. The survey would also help identify other infrastructure costs (such as piped water supply) and social costs (such as credit schemes) that would be necessary for the project benefits to permeate to the poor.

Specifically, survey design inputs may be as follows:

1. *Site selection*

Project area of influence: locations that house project beneficiaries and are likely to be adversely affected by the project (e.g. through air pollution, inundation)

2. *Sample size*

From statistical considerations, the minimum recommended sample size at the lowest strata for experimental research is 30 (Roscoe[11] 1975), which will ensure the benefit of central limit theorem.

3. *Sample distribution*

The distribution of the sample will take account of the following parameters:

- Households[12] representing all income classes
- Households with and without access to modern forms of energy such as LPG and electricity
- Farmers with various categories of land holding

The survey instruments may be appropriately designed.

Specific applications of the suggested framework

The Bank supports several types of energy projects/programmes. The figure 3 4 below shows ADB's energy sector priorities as reflected in various projects/ programmes the Bank supports, and how these can impact on poverty. Based on these impacts, the following section discusses relevant components of the suggested methodology that can be applied to other categories of energy projects.

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[11] Roscoe's simple rules of thumb are 1 The use of statistical analyses with samples less than 10 is not recommended, 2 In simple experimental research with tight controls (e g matched-pairs design) successful research may be conducted with samples as small as 10 to 20, 3 In most ex post facto and experimental research, samples of 30 or more are recommended, 4 When samples are to be broken into sub-samples and generalisations drawn from these, then the rules of thumb for sample size would apply to those sub samples for example, if comparing the responses of males and females in the sample, then those two sub-samples must comply with the rules of thumb, 5 In multivariate research (e g , multiple regression) sample size should be at least ten times larger than the number of variables being considered, 6 There is seldom justification in behavioural research for sample sizes of less than 30 or larger than 500 Samples larger than 30 ensure the researcher of the benefits of central limit theorem A sample of 500 assures that the sample error will not exceed 10% of standard deviation, about 98% of occasions.

[12] Also address the gender representation

The framework for estimation of benefits to the poor, as suggested above, may be typically applicable to a rural electrification type of project, where the beneficiaries are known. For other projects / project components, it may not be possible to identify project beneficiaries and a macro poverty intervention indicator (PII) may be estimated to assess the share of poor in incremental energy availability. This macro indicator may be estimated as a weighted average of the share of "poor" in various energy deficit sectors, the weights being the sectors' share in total energy deficit. A hypothetical example of a power transmission project is given below.

This project makes available 1000 kWh of incremental electricity, the distribution of which as envisaged in the project design is given in Column 2 in the table 3.2. Energy deficit sectors in the project's region of influence would need to be identified.

If the sectoral distribution is not available, it may be assessed using estimates of sectoral deficits. In the household sector, the deficit could be assessed by likely electricity demand by non-electrified households (number of households without access to electricity multiplied by normative electricity consumption per household) and unmet demand of electrified households (units not supplied due to power outages) In the agricultural sector, the deficit could be estimated by the amount of electricity required to replace diesel pumpsets in the region and hours of power outages. Similarly, in the industrial sector, electricity required to replace captive generation and hours of outages would provide an estimate of the deficit.

Next, to estimate the share of poor in the likely project beneficiaries, proxy indicators (suggested in column 4 in table 3.2) may be used. Of the poor, only a certain proportion would benefit from the project. This proportion would be a function of parameters such as tariff level and availability of micro credit, lifeline tariffs financed through the government budget and complementary infrastructure, which may be estimated through surveys or secondary data for other regions.

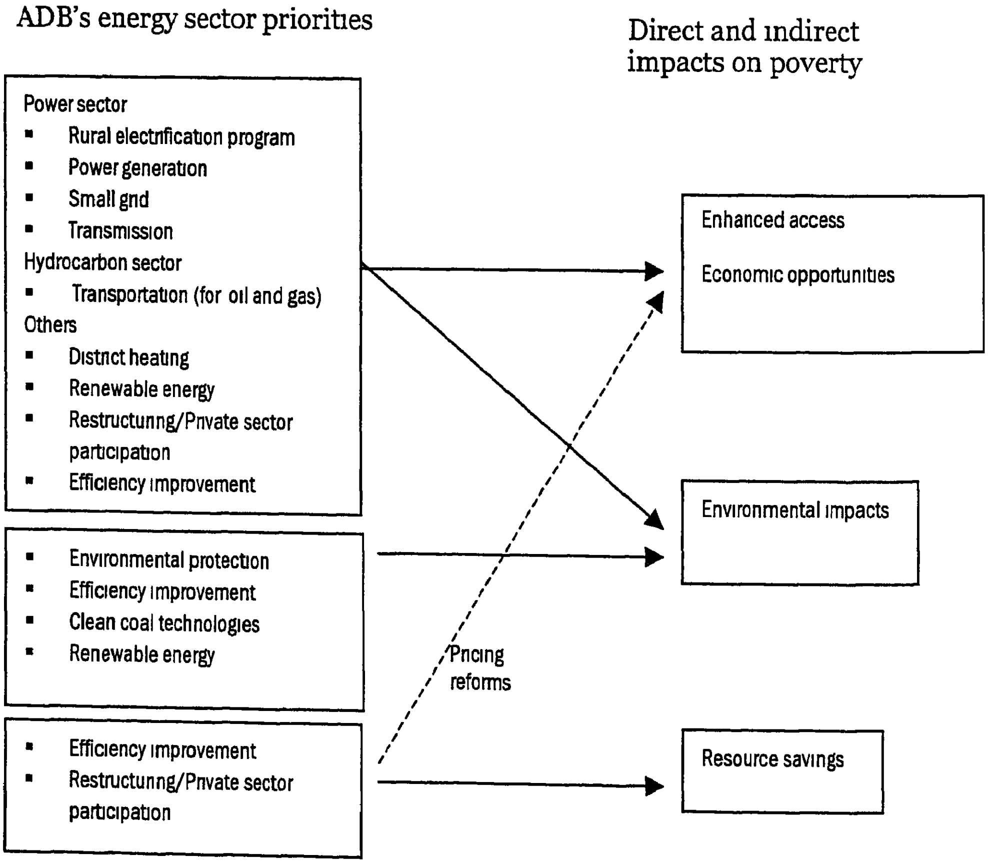
Table 3.2 Data required for estimation of PII

Sector	Energy deficit (hypothetical figures in kWh)	Share of sector in incremental electricity availability (hypothetical figures in kWh)	Sectoral share of poor		Share of poor likely to benefit from the project (hypothetical figures in %)
			Indicator	Hypothetical figures in %	
Households	1000	500 (50% of 1000)	Households below the regional poverty line/ households without access to electricity	65	55
Agriculture	600	300 (30% of 1000)	Small and marginal farmers	45	50
Industry	400	200 (20% of 1000)			

Estimation of PII
= [(55%*65%* 500) +(50%*45%*300)]/ (500+300+200)
= 25%

Finally, the PII (poverty intervention indicator) estimated at 25% suggests that this project can be classified as PI.

Figure 3.4 Mapping ADB's energy sector priorities into poverty alleviation goals



Note Dotted lines indicate indirect impact

Power transmission projects

Likely benefits of a power transmission project are discussed below.
At the macro level, efficiency gains as a result of the T&D strengthening will result in energy savings, which may be valued at the prevailing prices. Of these savings, the proportion going to the poor would be determined by the percentage of government spending on poverty alleviation programmes.

The poor are also likely to benefit through the trickle down effect of macro economic growth induced by increased availability of electricity. Such indirect impacts however are difficult to establish and assess.

At the supply end (namely at the construction and operation stages), the environmental and employment generation effects are not as significant as in the case of generation projects. However, in some cases, a transmission project may entail transfer of power from surplus regions to replace inefficient and polluting power plants in other regions as in the case of the Shen Da system improvement and electrification project (PRC) (see chapter 5). Here the impact of the project would include improvement in environmental quality and loss in employment due to closure of old power plants. Closure of inefficient plants may also lead to resource savings resulting from deferred constructions of new plants in the project area of influence.

At the consumption end, the benefits can be significant if the transmission facilities connect a hitherto non-electrified poor area to the grid. If the beneficiaries are clearly identifiable as in the case of a rural electrification project, the suggested methodology may be applied to capture the benefits accruing to the poor engaged in various economic activities. If the beneficiaries are not clearly identifiable but the region receiving incremental/improved electricity is known, the macro poverty intervention indicator (PII) may be estimated.

Oil and gas projects

In the oil and gas sector, there could be pipeline projects for gas transportation. It is possible that such projects provide households with access to piped gas and/or provide industries with access to natural gas as feedstock or for power generation.

For households provided with access to piped gas, benefits accruing from the use of cleaner, and more efficient cooking fuel may be estimated using the suggested methodology. Where industries benefit from increased access to natural gas, there will be favourable impact on poverty reduction only if new employment is generated either through additional shifts or new plants being set up. The ratio of benefits to the poor and the non-poor will be determined by the percentage of casual labour in the employment generated. In case, a project entails a shift in fuel use towards relatively cleaner fuels such as gas, there would also be positive environmental impacts.

Coal projects

Energy projects in the coal sector include district heating projects and promotion of clean coal technologies.

In the case of projects that provide steam and hot water through district heating systems, the benefits would be estimated by the value of traditional fuels replaced for space and water heating. Health costs averted due to the switch to cleaner fuels would also need to be built in

Projects for clean coal technologies would include coal washing; electrostatic precipitators; coal bed methane; fluidized bed combustion (FBC); integrated coal gasification combined cycle; and flue gas desulphurisation. For such projects, macro level benefits include coal savings due to enhanced conversion efficiency and the reduction in environmental impacts per tonne of coal converted. Coal savings may be valued at its prevailing price and the savings may then be distributed in proportion to government spending on poverty alleviation programmes. Environmental costs averted can be estimated using the recommended methodology. Environmental benefits accruing to the poor may be estimated by the percentage of people living below the poverty line in the vicinity of the project.

Renewable energy projects

Renewable energy projects may be treated as an energy generation projects with the added advantage of non-negative environmental impacts at the construction and operation stages. Benefits of replacement of traditional fuels in households, provision of incremental or more reliable power to agriculture and industry would be estimated using the methodology described earlier. Due attention has to be given to the fact that some renewable energy projects may reduce the availability of renewable fuels like biomass for other uses, as cooking fuel and cattle feed, for instance.

Cross-cutting projects

One set of cross-cutting projects may be categorized as energy sector restructuring which would include tariff reform, efficiency improvements, private sector participations and restructuring of utilities. Figure 3.3 traces the likely poverty alleviation impacts of such a programme loan in the power sector. In general, impacts of such projects would flow indirectly from the macro level. Such programmes are likely to yield additional resources for the government and/or the utility. Provided that the policy and institutional setting in the programme area of influence is pro-poor, it may be expected that a proportion of the additional resources available to the government will be invested for the welfare of the poor. This proportion – which may be taken as an surrogate measure of the poverty impact ratio – may be determined by the percentage of government spending on poverty alleviation programmes (including primary health and education, water and sanitation, rural development including rural electrification and agricultural development). In the case of tariff reform initiatives, there is a need to investigate the extent of price hike if any, with focus on fuels typically used by poor households. Adverse impacts of price hikes of such fuels may be mitigated through well-targeted subsidies routed through the fiscal budget and limited to basic needs. For projects that allow access of clean, efficient, and reliable energy to poor households at affordable prices, through pricing reform, direct benefits would accrue through the replacement of traditional fuels, which may be quantified using the suggested methodology described above.

Another category of cross-cutting projects is in the area of environmental protection or in areas that lead to increased and sustainable use of cleaner forms of energy. For such projects, segregation of benefits into those accruing to the poor and non-poor is particularly challenging. Project components would vary considerably from one project to another and it is not possible to present a generic framework. Parts of the methodology suggested above may, however be applied to specific components. This has been illustrated for components of the Acid Rain Control and Environment Control Project (PRC) (see chapter 5).

Monitoring of project benefits to poor

The Bank's guidelines on benefit monitoring and evaluation, though mandatory, have not been implemented in the recent past in the IEEN's energy portfolio. It is recommended that Bank should undertake an ex-post poverty impact analysis in order to verify whether benefits anticipated in the ex-ante poverty impact analysis accrue to the poor. This analysis would require collection of baseline data in project areas for the target groups as well as control groups for determining how the benchmark data (or outcome indicators) change due to project intervention.

Further, in order to provide additional support to the monitoring activity, community- based monitoring and evaluation groups should be encouraged This will not only provide the members of the community with an accurate picture of benefits and costs, but it will also facilitate: i) timely completion of the project, ii) in minimising rent-seeking activities, and iii) in ensuing support for beneficiaries for the project.

In the recent IEEN Power Rehabilitation Project of Tajikistan Project (Loan 1817 TAJ), a benefit monitoring and evaluation study was proposed during the benchmark survey, annual reviews and after completion of the project. The study is expected to monitor several indicators. It is proposed that such a study should monitor, over a period of time, the outcomes of the project across various economic activities as envisaged in the quantitative analysis. An indicative coverage of such a study for a power project is given below:

- Number of houses provided with access to electricity
- Changes in household expenditure on energy including investment in connection and appliances
- Electricity sale to the newly connected households
- New economic activities by households
- Non-income benefits in households (e.g. better lighting)
- Agricultural and industrial expansion
- Change in average income level of the project beneficiaries

The cost of conducting a monitoring study could be high. In a transport Study (Hansen 2000), the costs for a poverty impact analysis of an infrastructure road project covering the entire project cycle, including post completion surveys have been indicated at US$ 200,000-250,000. Given the high cost of such impact study, it is recommended that as a pilot case, IEEN should conduct a poverty impact study in one of its existing rural electrification projects by using a combination of methodology as discussed in earlier sections.

Poverty impact assessment: guide for the project officer

Based on the earlier discussions, this section provides a summarised step-by-step guide to project officers in studying the impacts of energy projects and designing projects that maximise poverty reduction impacts (details can be seen under relevant preceding sections of this chapter).

This requires that poverty concerns be explicitly integrated right from the project planning stage. This guide should be used in identifying poverty-related issues in the ISA (initial social analysis) during the fact-finding for the PPTA (project preparatory technical assistance), during the PPTA, the feasibility study, preparation of the RRP (Report and Recommendations of the President), implementation, monitoring and evaluation of the project/programme.

Step 1. Qualitative assessment of impacts (during PPTA and feasibility studies)

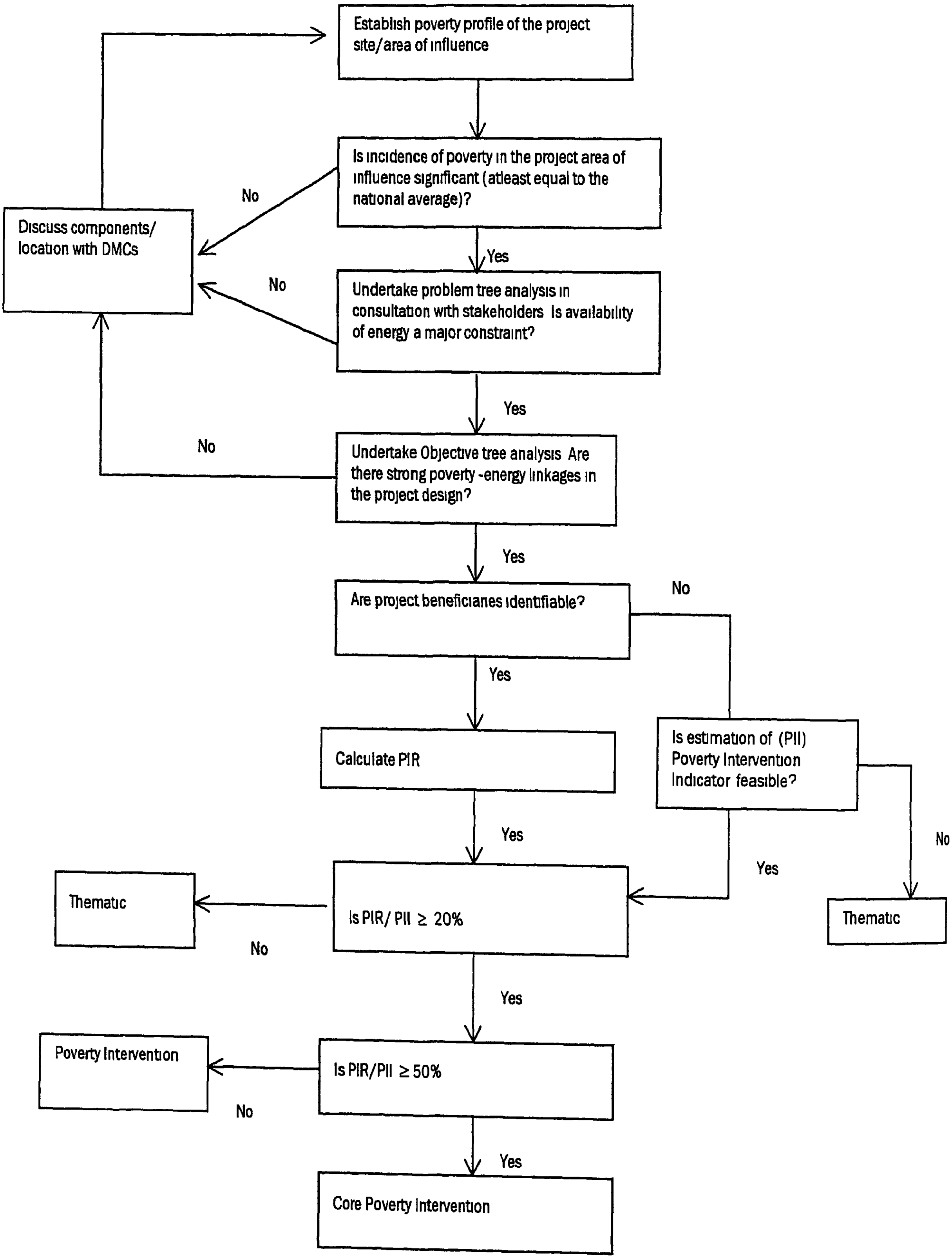
- Preparing a poverty profile of the project area of influence
- Identification of beneficiaries and stakeholders of the energy project
- Needs assessment and problem tree analysis
- Objective tree analysis : tracing the effects and impacts of energy projects

Step 2. Quantitative assessment of impacts - assessment and evaluation of benefits and apportioning them to the poor (during PPTA feasibility study and loan processing)

- Supply stage (macro e.g. resource savings; and specific to the project site)
- Consumption stage (sectoral assessment)
- Estimation of project PIR/PII (poverty intervention indicator)

Step 3. Project classification

Figure 3.5 Decision tree for project classification


Establish poverty profile of the project site/area of influence
Is incidence of poverty in the project area of influence significant (atleast equal to the national average)?
No
Discuss components/ location with DMCs
Yes
No
Undertake problem tree analysis in consultation with stakeholders Is availability of energy a major constraint?
Yes
No
Undertake Objective tree analysis Are there strong poverty -energy linkages in the project design?
Yes
Are project beneficiaries identifiable?
No
Yes
Calculate PIR
Is estimation of (PII) Poverty Intervention Indicator feasible?
No
Yes
Yes
Thematic
Is PIR/ PII ≥ 20%
Thematic
No
Yes
Poverty Intervention
Is PIR/PII ≥ 50%
No
Yes
Core Poverty Intervention

As the decision tree shows (Figure 3.5), poverty considerations need to be built into the project design at an early stage. The location and components of the project need to be designed and modified in consultation with the DMCs such that the project can effectively target poverty.

Step 4. Delivery mechanisms (during loan negotiations)

- Identify policy initiatives, legislative reforms and institutional mechanisms required to ensure that project benefits reach the poor with minimum leakages

Step 5. Project implementation

- Modify project components in the light of any significant change in the project area

Step 6. Benefit monitoring and evaluation

- Ex-post poverty impact analysis involving communities and stakeholders
- Identifying negative impacts of the project and factors that constrain/limit the participation of the poor in project implementation and benefits
- Identify mechanisms/projects that would mitigate the negative impacts/ maximize percolation of positive impacts
- Identify lessons for future projects

4

Enabling poverty reduction through energy projects

As discussed in the earlier chapters, energy projects have enormous potential for poverty alleviation. However, for energy projects to have significant poverty impacts, several enabling mechanisms need to be in place. Aspects of project location and design are also crucial for energy projects to become poverty interventions.

nabling mechanisms

By "enabling mechanisms", we refer to non-project related issues that facilitate poverty alleviation. Policy and institutions that constrain effective project implementation or the presence of strong anti-poor lobbies may hinder the flow of benefits to the poor. If energy pricing is prohibitively high, the poor may never be able to afford it. Price distortions may also come in the way - for instance, highly subsidised prices for kerosene may be a disincentive for a switch to electricity for lighting. In such contexts, if the energy project provides poor households with physical access to modern forms of energy, this will be merely symbolic.

As stated earlier, energy projects are generally beneficiary neutral unless specifically targeted at a certain section of the population, as in the case of rural electrification projects. As discussed in Chapter 2, it is also important that the policy setting in the project area of influence is pro-poor, of which one indicator is government spending on poverty alleviation programmes.

Examples of enabling mechanisms that could help ensure that project benefits permeate to the poor include:

- Targeted subsidy schemes, routed through the fiscal budget, for families living below the poverty line – for tariffs on energy to meet basic needs, for connection costs and enduse devices.
- Microfinance schemes to provide cheap and easy funding to the poor to meet capital expenditure (such as on connection costs and energy appliances) that enable the poor use the energy to which the project provides them with physical access
- Complementary schemes set up by government or non-government organisations: In addition to direct benefits from energy consumption,

households may reap large benefits through the fulfilment of other basic needs facilitated through the provision of energy. Examples of extended energy services include physical security (through improved illumination provided by electric street lighting), health (through improved medical testing facilities), piped water or better-equipped schools.
Deregulation of the energy sector under way, indicating the desire of the State to achieve efficiency improvements and move towards full-cost pricing: Technical and economic efficiency improvements lead to resource savings in the long run, freeing resources for alternative more pressing uses including poverty alleviation programmes

The location, design, implementation, monitoring and evaluation of an energy project significantly influences its poverty reduction impacts.

Project location

For a project to have significant poverty reduction impacts, its area of influence must have the following characteristics:

- High incidence of poverty (higher than the national and/or Asian average)
- Large number of households with no or limited access to modern forms of energy like LPG and electricity
- Low literacy rate – contributing to large unskilled labour force
- Predominantly irrigated agriculture (particularly for power projects)
- Availability of energy a constraint to industrial expansion
- Presence of co-operatives and NGOs with a record of setting up sustainable community projects
- Pro-poor policy/institutional setting, indicators of which include:
  - government spending in poverty alleviation programmes, in the social sector and in social infrastructure,
  - targeted and efficient schemes for provision of basic needs to very poor households,
  - changes in inter-class income distribution,
  - inclusion of disadvantaged groups (in terms of gender, income or caste) in the decision-making process, and
  - social security provisions such as the right to unemployment benefits.

Project design process

The following aspects are to be borne in mind in designing energy projects:

- Participatory approach - For projects to be acceptable to and most beneficial to local communities, projects will have to be designed in consultation with them and address their felt needs. This is elaborated in Chapter 3.
- Components specifically targeted at the poor – e.g. rural electrification in a village with high incidence of poverty – would enhance the likelihood of impacting on poverty. In the context of rural electrification, decentralised off-grid technologies offer added advantages in terms of reaching out to far-flung areas, encouraging local participation, creating employment opportunities and making it possible to adopt discriminatory pricing for a small cluster of poor households
- Ex-ante assessment of poverty projects proposed to be used in classification of projects would also provide useful inputs for project re-design.
- Groups and regions likely to be adversely impacted by the energy project (through displacement, loss of employment, higher pollution levels or inundation) must be clearly identified. If the proportion of poor in the affected population is high, the project must be reviewed critically because the poor are impacted disproportionately in such situations. For all projects, it is necessary to ensure that those adversely affected are compensated adequately and that these compensation costs are factored into project costs. It would be useful to check on the track record of the government in the disbursal of compensation.
- Complementary projects such as schemes for piped water, improved sanitation, street lighting, better-equipped health centres etc. would be facilitated by the provision of energy, and would help maximise the poverty reduction impacts of energy projects.

Implementation, monitoring and evaluation

Apart from ex-ante assessment of poverty impacts, energy projects would also need to be monitored and evaluated for poverty reduction outcomes. Continuous monitoring is essential to ensure that projects are implemented as planned and that flow of project benefits, especially to the poor, exceeds expected levels. Examples of outcome indicators for quick review would include:

- Increase in number of households with access to modern energy forms
- Increase in employment or income of agricultural labour
- Increase in employment or income of unskilled labour

- Increase in proportion of households with access to piped water, safe drinking water, sanitation facilities
- Decrease in incidence of water and air-borne diseases
- Increase in overall economic activity

5 Analysis of IEEN projects

Analysis of select IEEN projects

A sample of six IEEN projects has been analysed to understand the methodology currently adopted in loan processing, and estimating the project's poverty reduction impacts (For details see Annexure 5.1).

1. Transmission connection and reinforcement project (RRP: PHI 29505, May 2000) in Philippines.
2. Sixteenth power (Maninloc Thermal Power) project (Loan 1042 PHI) in Philippines.
3. Wind power project in PRC (Loan No. 1818 PRC)
4. Power rehabilitation project (Loan No. 1817 TAJ).
5. Power sector restructuring programme in Indonesia (Loan No. 1673 INO).
6. Renewable energy development project (TA 3056 PRC).

Table 5.1 Analysis of IEEN projects against select benchmarks

Project	Cause and effect analysis with poverty focus	Objective tree with poverty focus	Participatory[b] approach during project design	Benefit monitoring poverty data	Distribution analysis and calculation of PIR
1. Transmission connection and Reinforcement in Philippines	✓	✖	✖	✖	✓
2 Sixteenth power (Maninloc thermal power project) in Philippines	✖	✖	✖	✖	✖
3. Wind power development project in China	✖	✖	✖	✖	✖
4 Power rehabilitation project in Tajikistan	✓	✓	✓	✓	✓
5. Power sector restructuring in Indonesia	✖	✖	✖	✖	✖
6. Renewable energy[a] development project in China (TA)	✖	✖	✖	✖	NA

[a] The TA report, however, contained a small section, in generic terms, on the nature of poverty interventions to people living in 'remote' isolated areas

[b] This is described in Chapter 3, and annex 3.1

The analysis (Table 5.1), has been carried out against certain benchmark parameters such as 1) whether the project has conducted a 'cause effect' analysis on poverty; 2) whether the project has prepared an objective tree with a poverty focus, which is a next step of the 'cause effect' analysis; 3) whether a participatory approach during project design, especially from the view point of poverty reduction has been undertaken; 4) whether the project has established benefit monitoring data for assessing the poverty reduction impact of the project; and 5) whether distributional analysis of net project benefits have been made, and PIR calculated as required under existing ADB guidelines It is easy to conclude that against these benchmarks, only one project fared satisfactorily. The Tajikistan project RRP contained all the features, that a project with an objective to maximize its poverty reduction impact should take into account. Since the poverty reduction is now the overarching objective of the ADB, and if each loan is to reflect this concept, it is suggested that all loans should be subject to testing against these benchmarks, as discussed in Chapter 3.

IEEN pipeline during 2001-03

During 2001-03, the ADB (IEEN) is expected to process 16 project loans worth US$ 1700 million, and 29 technical assistance loans worth US$ 20.1 million in the energy sector covering six countries such as Philippines, PRC, Indonesia, Kazakhstan, Kyrgyz Republic, and Tajikistan. Out of these, the CAP (Country Assistance Plan) has classified only one loan as PI[13], the remaining as ODI (other development interventions) (Table 5.2).

Table 5.2 Details of IEEN'S energy sector pipeline during 2001-03

	Project loan (US$ in million)	Technical Assistance (US $ in thousands)
Philippines	260(3)	2900(4)
China	900(6)	8200(11)
Indonesia	450(3)	2300(3)
Kazakhstan	30(1)	2200(3)
Kyrgyz Republic	40(2)	1850(4)
Tajikistan	20(1)	2700(4)
Total	1700(16)	20150(29)

(Figure in the bracket indicates the number of loans/TA)

An analysis of IEEN's pipeline (Table 5.3) shows that there is a considerable emphasis on the generation and transmission project in the DMC during the 2001-03 programme cycle: about 32 per cent of the proposed investment is expected to flow in these kind of projects.

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[13] Western region small hydro power and rural electrification project in China

Table 5.3 IEEN pipeline 2001-03: type of projects

Type	As percent of total project loan
Generation and transmission	32.35
Rural electrification[a]	24 12
Renewables	10
Environment related project	21.76
Others	11 76

[a] Assuming that the outer island electrification project in Indonesia falls in this category

Poverty reduction analysis of IEEN projects (2001-03): approach for quantitative analysis

Given the methodology suggested in Chapter 3, the following sections outline an approach for the quantitative analysis of the individual projects in IEEN's 2001-03 pipeline to assess their PRP (poverty reduction potential) ex-ante, and to suggest steps so that these could maximise the poverty reduction impact. The analysis is constrained by the fact that most of the project components and some of the project concepts are yet to be finalised by the IEEN in consultation with the DMCs. However, an attempt has been made to analyse the PRP of these projects on the basis of the information made available to the study team

Project 1: Shen Da System Improvement and Electrification Project (PRC)

The CAP (country assistance plan) classified this project as ODI (other development interventions). The project will evacuate the surplus power in Inner-Mongolia and transmit it to Dalian, which will help meet the electricity demand in a way that does not place additional stress on the air quality in Dalian. The CAP further said that the evacuation of surplus power in Inner Mongolia, a poor province in the western region, would result in significant economic growth in the region. The project will allow the LEPC (Liaoning Electric Power Company) to allocate sufficient funds for rural electrification programs in Liaoning, which will have social benefits through expanded rural electrification in poverty stricken area, and also ensure environmental benefits through reduced use of coal for domestic purposes.

Liaoning province is a major industrial base in the country. Its power demand growth is expected to be highest in the north eastern region. By 2005, the electricity demand is assessed at 87 TWh, which cannot be met by the installed capacity in the province, especially in the areas served by the Liao Zhong and Lianoning networks, thus necessitating power supply from the northern parts of the regional power system. Thus, the project is expected to meet the deficit by transferring power from the northern region. The project is a part of the Long Term Transmission System Master Plan for the north-east plan (which also envisages construction of large mine mouth power plants in the coal rich eastern region).

Closure of old and inefficient coal fired power plants could create significant positive impact on air quality. In addition, a stronger provincial grid and regional networks will allow bulk power transfers to major load centres, and will result in reduced system losses, better use of energy resources, economies of scale, improved power supply reliability etc. The project will facilitate the next phase of power sector reforms in Liaoning that could lead to the introduction of competitive power markets. Accordingly, the project's objectives and components, as indicated in the CAP, are indicated as:

Project objectives

- Support sector and enterprises reforms in power sector of Liaoning province.
- Augment power transmission capacity and system improvement to support economic development in the province.
- Expansion of electricity in rural areas.
- Improvement of environment of through closure of old and inefficient thermal plants.

Project components

- Establishing additional 500 kV transmission facilities.
- Providing related 110 kV and 220 kV transmission facilities.
- Modernising the old dispatch and communication system.
- Connecting to rural households in Liaoning.
- Closing down inefficient and polluting power plants.

Suggested poverty impact analysis

Given the project design, as stated above, the project is likely to be thematically classified as 'economic growth'. The poverty reduction analysis can be undertaken on the following lines:

a) Impact of macro economic 'performance'.
b) Environmental improvements.
c) Impact of rural electrification in Liaoning

Macro economic effects on poverty reduction

The project will enable transfer of power to meet the projected power deficiency of 691 MW in 2000, which would grow to 2530 MW in 2005. The industrial base in Liaoning province will promote growth in the area resulting in growth of output and employment/income. Further, the use of power in social sectors (e.g. education, health) will have a direct role in poverty reduction in urban as well as rural areas.

Investments in transmission facilities will reduce T&D losses, which in turn will result in energy savings and improve the quality and reliability of power supply. Reliable power in the Dalian region (population 5.4 million) will induce growth in the industries and other sectors through backward and forward linkages. These will generate employment/income not only to urban and rural poor in the areas, but also to the other regions in PRC.

Macro economic effects could also result from enhancement of the tax base through increase in income in the agricultural and industrial/commercial sectors.

Estimation of macro impacts

The annual macro economic impacts of the project (B_M) may be estimated by the sum of the value of electricity saved per year through reduction in T&D losses and expected enhancement in annual tax revenues from the expected increase in agricultural and industrial income. Electricity savings may be valued using the prevailing power tariff. Increase in agricultural income may be estimated using the output on increased gross cropped area (see section on agriculture below) and increase in industrial income would be equal to the incremental output from new and existing industries (see section on industries below). Of B_M, a portion equivalent to the percentage of government spending on poverty alleviation programmes would constitute the macro economic benefits accruing to the poor (B_{MP}).

There may be other equally important indirect macro economic benefits such as second tier employment and income gains, fiscal stability arising out of increased revenue to/reduced spending by the government. Financial income from salvage of the government-owned coal-fired plant being shut down and expenses on laying of transmission lines and so on have also not been included.

Impact in the project area

The key project components have been listed above. While some of these components have macro economic impacts, others have direct local repercussions. The direct impact may be assessed as follows.

Component: Closing down inefficient and polluting power plants in Dalian.

Quantifiable impact:

- Improvement in environmental quality.
- Loss in employment.

Estimation of impact

1. Improvement in environmental quality

As explained in Chapter 3, simulation models to estimate changes in ambient air quality along with dose response functions can be used to estimate environmental costs averted. The steps involved are as follows:

- Estimate changes to ambient air quality and a concentration profile for the area around the plant using ambient air quality simulation models during the environmental assessment of the project (these models would require data such as emission loading, stack height and wind speed and direction).
- Use the concentration profile and the population profile to estimate the population under risk. Estimate the health impact of main air pollutants using dose response functions drawn from epidemiological studies done for similar regions.
- Use primary surveys/secondary information and discussions with local medical professionals to estimate the treatment costs for various health problems. Value of days lost can be estimated at the shadow wage rate.
- Total environment benefits from closing down of inefficient plants (B_E) will be given by the net present value of the value of environmental costs averted (cost of treatment and value of days lost) over the lifetime of the project.
- The share of poor (B_{EP}) in total environmental costs averted may be estimated by the percentage of affected population living below the poverty line.

2. Loss of employment

Total annual losses can be calculated as follows:

Persons laid off * shadow yearly wage rate (average for skilled and unskilled labour).

Annual losses to the poor can be calculated as follows:

Unskilled labour laid off * Shadow yearly wage rate for unskilled labour.

Total employment losses (B_L) from the closing down of plants will be given by the net present value of the wages lost annually over the remaining lifetime of the plant being shut down. Similarly, losses for the poor (B_{LP}) will be estimated by the net present value of the wages of unskilled labour lost annually over the remaining lifetime of the plant being shut down.

Component: Rural electrification in Liaoning

Though this component is not funded[14] directly by the Bank, funding of other components makes it possible for the LEPC (Liaoning Electric Power Company) to invest in rural electrification programmes in the province. The impact of these programmes on poverty would be determined by the nature of economic activity in the villages to be electrified. Benefits would accrue from energy consumption in households, agriculture, and industry and commercial sectors (see chapter 3).

Quantifiable impact and estimation .

Households

1. Net annual savings in time and money due to provision of reliable electricity may be estimated as given below:

Net benefits for poor households

(Volume of traditional fuel replaced by electricity* Market price of traditional fuel) – (Units of electricity required * Electricity tariff) – (Annualised costs of electricity connection and electric appliances)

Net benefits for non-poor households (that are assumed to have access to electricity)

(Estimated units of electricity consumption[15]* WTP for electricity) – (Current electricity consumption * Electricity tariff) – (Annualised costs of new electric appliances)

2. Value of time saved annually due to use of efficient fuels for cooking

Poor households

(Time spent on cooking with traditional fuels – Time required for cooking using efficient fuels – Time required for additional meals that may be cooked) * Shadow wage rate for unskilled labour

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[14] See CAP (PRC) 2001-03

[15] Estimated from primary surveys using the sum of current power consumption, power that would have been consumed during times of power outage and likely increase in consumption (through use of new electric devices which may be bought when power supply becomes more reliable).

Non-poor households

The impact on non-poor households which have access to electricity would be minimal.

3. Health costs of indoor air pollution resulting from use of traditional fuels in poor households

Poor households

- Identify the key pollutants associated with the predominant fuel used in poor households.
- Estimate the concentration of pollutants in smoke (as estimated through studies in the region or other socio economically similar regions).
- Use the dose response function and population using these fuels to predict the number of health events due to poor air quality.
- Use secondary information and discussions with local medical professionals to estimate the treatment costs for each disease.
- Use primary surveys and discussions with local medical professionals to validate the number of working days that may be lost due to the disease.

The total cost of each ailment may be assessed as follows:
(Number of individuals likely to contract the disease)* (Treatment cost for the disease + (Likely number of person days lost * Shadow wage rate for unskilled labour)

This methodology may be used to estimate the costs of various ailments, which could then be summed up to arrive at the total cost of illness attributable to use of traditional fuels. The rural electrification project would enable poor households to avert this cost of illness. Thus, this would be one of the benefits accruing to the poor as a result of the project. Corresponding benefits for the non-poor would be negligible.

Total benefits (poor and non-poor) in the household sector (B_H) would, therefore, be the sum of net annual savings in time and/or money due to provision of electricity, value of time saved annually due to the use of efficient fuels for cooking, and health costs averted. Corresponding benefits accruing to the poor may be represented by B_{HP}

Industries

As discussed in chapter 3, poverty impact of energy use in industry can be estimated using employment generated in existing and new industries.

1. Employment benefits of improved capacity utilisation in existing industries.

Total employment benefits in existing industries
Number of additional shifts possible due to increased availability of energy* total employment per shift* Shadow wage rate (average for skilled and unskilled labour).

Employment benefits to the poor in existing industries
Number of additional shifts possible due to increased availability of energy* Total employment of unskilled labour per shift* Shadow wage rate of unskilled labour

2. Employment benefits of new industries

Total employment benefits in new industries
Total employment potential of the industries * Average shadow wage rate

Employment benefits to the poor in new industries
Total employment of unskilled labour in the industries * Shadow wage rate of unskilled labour

In the industrial sector, total employment gains may be represented by B_I and employment gains for unskilled labour by B_{IP}.

The data required for this method have been indicated in Table 3.1 in chapter 3. Whether existing industries are operating below full capacity and to what extent would capacity utilisation improve if the energy project is set up, would be ascertained through surveys of main industries and comparison with similar industries in other regions. The surveys would also reveal the employment generation potential of this capacity increase.

The possibility of new industries and consequent employment generation is more difficult to establish. However, if the project design incorporates likely electricity demand by new industries in the region, the above method may also be applied to these industries. Additional data would also be required to assess whether availability of raw materials and other inputs (like land) is sufficient to allow additional production even if energy supply is enhanced.

Agriculture

Additional or more reliable electricity for agriculture can impact poverty in three ways:

1. Reduced energy costs

Total benefits: estimated for large, small and marginal farmers

(Volume of alternative fuels like diesel replaced by electricity for running pumpsets* Market price of alternative fuels) – (Units of electricity required * Electricity tariff)

Benefits to the poor: estimated for small and marginal farmers

(Volume of alternative fuels like diesel replaced by electricity for running pumpsets* Market price of alternative fuels) – (Units of electricity required * Electricity tariff)

The information on current fuel consumption and likely substitution by electricity would have to be collected thorough a survey of large, small and marginal farmers.

2. Increased value added on all landholdings arising out of an increase in gross cropped area due to increase in cropping intensity or additional land under cultivation

Total benefits: estimated for large, small and marginal farmers

$$[\text{Increased area under cultivation}]* \\ [(\text{Output per unit area} * \text{Price of output}) - \sum_{inputs}(\text{Input per unit area} * \text{Price of input})]$$

Benefits to the poor: estimated for small and marginal farmers

$$[\text{Increased area under cultivation}]* \\ [(\text{Output per unit area} * \text{Price of output}) - \sum_{inputs}(\text{Input per unit area} * \text{Price of input})]$$

A primary survey would be needed to assess whether farmers would increase cropping intensity or bring additional land under major crops if energy from the project is made available. Output production and input use norms per unit area would be based on existing studies while the prices of inputs and outputs would be market determined on the assumption that these changes are too small to affect the market prices or that there are support prices set by the government.

3. Employment generated due to increase in cropping intensity or additional land under cultivation.

Employment benefits to the poor

(Increased gross cropped area)* (Employment per unit area) * (Shadow wage rate in the farming sector)

The entire employment benefit in agriculture would accrue to poor farmers. Employment benefits can be estimated using employment norms for the principal crops and the shadow wage rates.

In the agricultural sector, the income gains (due to reduced energy costs or increased value added) and employment gains would capture total benefits in the sector (B_A), while benefits to the poor (B_{IA}) would equal income gains on small and marginal holdings and all employment gains.

For estimation of net benefits in the agricultural sector, secondary information would be needed on landholding distribution, main crops in the region, yields, level of the water table (to study whether additional groundwater extraction for irrigation of increased gross cropped area, is possible or desirable). Data requirements are listed in Table 3.1.

Calculation of PIR

To sum up, the main project benefits- total and to the poor are as follows.

Macro benefits:

Total: $B_1 =$ NPV of B_M over the lifetime of the project

Poor: $B_{1P} =$ NPV of B_{MP} over the lifetime of the project

Environmental costs averted and employment losses due to closure of inefficient plants at Dalian:

Total: $B_2 = B_E - B_L$

Poor: $B_{2P} = B_{EP} - B_{LP}$

Electricity consumption benefits in residential, agricultural and industrial/commercial sectors:

Total: B_3 = NPV of $(B_H + B_A + B_I)$ over the lifetime of the project

Poor: B_{3P} = NPV of $(B_{HP} + B_{AP} + B_{IP})$ over the lifetime of the project

The PIR defined as the ratio of benefits accruing to the poor to the total project benefits would be given by:

$$PIR = \frac{B_{1P} + B_{2P} + B_{3P}}{B_1 + B_2 + B_3}$$

In the above example it has been assumed that the incremental electricity transmitted will be used for rural electrification in Liaoning. If electricity is made available to urban areas, the above analysis at the energy consumption stage should be extended to these areas as well for calculation of benefit accruing to the poor in the urban areas.

Estimation of macro poverty intervention indicator (PII)

In case the transmission facilities feed a large area and the beneficiaries are not identifiable, a macro indicator – the PII may be used to estimate the share of poor in the project beneficiaries. The PII is the weighted average of the share of "poor" in various energy deficit sectors, the weights being the sectors's share in total energy deficit. The PII as worked out for a hypothetical example is illustrated in Chapter 3.

Project classification

The PIR and PII would form the basis of project classification depending on the relative importance (in terms of coverage and/or investment) of the project components for which the two are estimated. If the rural electrification component is a significant part of the project, the PIR could constitute the basis for project classification. However, if it is a relatively small project component, project classification could be carried out on the basis of PII. In the latter case too, the PIR should be calculated because the process of impact assessment provides useful inputs into project designs and benefit monitoring.

Project 2: Acid Rain Control and Environment Control Project (PRC)

The project aims to address environmental concerns due to acid rain deposition in the south-west and eastern Yangtze river valley in Anhui province. Acid rain is caused by SO_2 emissions; nitrogen oxides can also be significant factor. The combustion of coal for energy production is the major reason for emission of acid rain causing gas. Industrial processes and motorised vehicles also release significant amount of SO_2 and nitrogen oxides, especially in the industrial centres and urban location in the area. The acid rain control zone under the project is expected to cover 10 designated poverty counties out of the 22 poverty counties in the Annui province, of which four fall in its acid control zones. Acid rain reduction, and environmental improvement in the province are expected to enhance soil and water quality; and thereby, improve agricultural and forestry production. Additionally, improved air quality will also improve the health condition of the poor people. The project has been classified under the CAP as ODI with environment as its cross cutting operational priority. Under the CAP, the project aims to:

- Formulate measures for improving the policy framework for reduction of SO_2 and other acid rain causing gas emissions.
- Finance sub projects that promote cleaner production, reduce acid rain and air pollution improve environment.
- Strengthen institutions for environment monitoring and enforcement including human resource development.

Project components discussed during TA negotiation stage (2000)

- Relocation of Wuhu Feiyeng Wood Chemical Corp. Ltd. to Wuhu Industrial Estate.
- Relocation of Wuhu Limin Dyestaff Plant to Wuhu Industrial Estate,
- Protection of drinking water sources in Wuhu city.
- Reduction of industrial discharges in Wuhu Iron and Steel Plant, modernisation for cleaner production, substantial reduction of air emission and water pollution.
- Partial reduction and cleaner production in Chizhou Non ferrous metals company; including relocation of some facilities, reduction of air pollution (including toxic pollutants).
- Waste minimisation in Arnquing cement plant and Arnquing power plant; utilisation of fly ash to reduce air pollution and prevent further degradation of valuable urban land.
- Industrial technology enhancement of Tonglin chemical industry group, Wuhu Hengxin metal group, and Tonglin Jinchang metals.
- Environmental rehabilitation and conservation of the Yellow mountains World Heritage system.
- Rehabilitation of environment and biodiversity protection in the Jinhua mountains national park.

- Strengthening of Anhui provincial and municipal EPBs.

Since the cause of acid rains could include factors such as use of coal for domestic heating purposes, or non-point coal burning sources, the cost effective options in project areas should include:

  - District heating, and
  - Power plant rehabilitation

Suggested poverty reduction analysis

The following should be considered by the project officer during the assessment of the poverty reduction potential of the project:

- Relocation of various industries
  - Calculate net employment benefit/losses to the urban poor in the new relocated site, as against the original sites
  - Assess the overall environmental impact in new and original sites. The poor will be benefited disproportionately
- Protection of drinking water sources in Wuhu city
  - Assess indirect impact on health
    - Urban poor are benefited disproportionately
- Improvements in industrial energy efficiency and environmental performance
  - Calculate the extent of energy efficiency due to adoption of clean technology and the resulting energy savings. The resulting fiscal resources being freed should be used for poverty reduction programmes in PRC. The project officer should discuss these issues with the PRC.
  - Assess health impact due to less production of heavy metals or arsenic layers; urban poor will be benefited disproportionately
- Utilisation of fly ash
  - Reduced water pollution. Assess impact on health. Show how poor are vulnerable without this step
- Conservation/rehabilitation of rural ecosystem
  - Tourism development
    - Calculate the employment potential to the poor, in and around Yellow Mountains
  - Agricultural yield
    - Assess impact on agricultural production around the area. Calculate its impact on rural income/employment

Remarks

- Use the participatory approach to assess the views and perceptions of the poor (including women) on the project components.
- Add sub project, based on the needs of the poor, in the poor counties within the project area, if required.
- Use the poor's share in the population as the share of benefits accruing to the poor, although this is a conservative estimate.

Possible project classification: Thematic – environmental protection

Project 3: Western region small hydropower and rural electrification (PRC)

The project has been classified as a PI project in Gansu, a North West Province, one of the poorest provinces of PRC, although it is very rich in energy resources such as gas, hydropower, and coal. It has 41 poverty counties, 81.51 per cent of its population living in rural areas, and 45.15 per cent rural population with less than RMB 500[16]. The project will assist in providing adequate electricity supply to power deficient rural areas, thus contributing to creating an environment for economic growth and improved living standards of rural households. The direct beneficiaries of the project will be the existing and future industrial, commercial, residential and agricultural consumers in rural Gansu Province. Also, by supporting the development of hydro power resources in Gansu, the project will avoid construction of coal fired plants.

Project objectives included in CAP are:

- Increase power supply to rural areas near Langzhou.
- Upgrade expansion of electricity distributions in rural areas.
- Improvement of environment through avoiding polluting thermal plants.

Project components being considered are:

- Augment power supply capacity in Gansu with construction of Chaijiaxia 90 MW run-of-river hydro power plants and Hekou 90 MW run-of river hydro river power plant.
- Provide 110 kV sub transmission line for grid connection.
- Improve rural distribution system.

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[16] PRC considers Y 635 as the poverty level while ADB takes Y 1000 as the poverty level for rural areas

- Institutional strengthening of GHHDC (Gansu Hexi Hydro Power Development Company).

Suggested Poverty impact analysis

The analysis for estimating the project's impact on poverty reduction should be made on the following lines:

- Environmental improvement during the generation of hydro power
  - Calculate the net impact in the use of hydro over thermal power generation. The poor in Gansu areas will gain more due to environmental improvement.
  - Calculate the employment/income to the poor at the project site during construction/operation of the power plant (Use framework at Chapter 3).
- Benefit to the poor at the stage of electricity consumption in rural Gansu province. By using framework discussed in chapter 3,
  - Calculate the benefit to the poor in residential sector
  - Calculate the benefit to the poor in agriculture sector
  - Calculate the benefit to the poor in industrial/commercial sector
- Calculate macro economic impact on poverty reduction (see Chapter 3)

Remarks

- Use participatory approach for better project design.
- Initiate dialogue with PRC, for complementary infrastructure provision in rural areas.
- Use PIR to classify the project as PI (It appears that the project areas will have less than 50 per cent poor population. Hence CPI classification may not be possible).

Project 4: Hebei Zhanghewan Pumped Storage (PRC)

Hebei Province of PRC has 39 poor counties; 83.9 per cent of the population lives in rural areas, and 15.56 per cent rural population has a per capita income less than RMB 500. The project has been classified as ODI in CAP. The HSPG (Hebei South Power Grid) experiences frequent power interruptions due to inadequate capacity in its power grid to meet the growing peak load. The neighbouring China Grid does not have spare peaking capacity for the HSPG. As a result, the HEP (Hebei Electric Power Company) operates its coal fired power-generating plants for peaking, although these are not sufficiently flexible to meet the rapid load variation during the peak hours. In poor counties within the project areas, supply constraints limit the use of electricity for lighting purposes. The stated project objectives and project components are indicated below:

Project objectives

- Increased power supply, thereby supporting economic growth in Hebei Province.
- Improve quality of power supply to all consumers.

Project components

- Construction of 1000 MW Zhanghewan pumped storage power plant.
- Construction of a 56 km long 500 kV transmission line connecting the storage plant to Hebei south system at Shinan sub station.
- Closure of power generating units 50 MW or smaller in six coal fired plants (totalling 566 MW).
- Rural electrification in one city and 19 counties (of which, ten are national poverty counties, and four are provincial poverty counties) consisting of sub station and distribution system at 400v, 10KV, and 110KV at two different stages.
- Strengthening HEP's institutional capacities.

Suggested poverty impact analysis

The project officer should carry out the project's poverty reduction in the following manner:

- Macro economic performance affecting poverty reduction
  - Estimate the income gain to government due to incidence of tax on the additional income/employment in agricultural and industry sectors due to available reliable power supply. Out of this, calculate the share of the benefits accruing to the poor
  - Fiscal stability due to increased revenue to government. Also indirect macro economic benefits such as second tier employment and income gains
- Environment improvement
  - Calculate the net environmental benefit due to closure of six coal fired plants (totalling 566 MW): calculate the gain to the poor using proportion of the poor in the total population in the project areas of influence.
  - Calculate the employment loss to the poor unskilled labour due to closure of plants

  - Calculate the net benefit/loss at the stage of construction of pumped storage plants (use framework in Chapter 3). Estimate the net benefit/loss accruing to the poor.
- Rural electrification: its effect on poverty reduction
  - Use the methodology as indicated in the Shen Da project (PRC)
- Calculate macro PII, as indicated in Chapter 3

Project 5: Inter-Regional System improvement (PRC)

The power system in China comprises of 27 provincial power grids. In order to enhance the efficiency of the power system and to alleviate the power shortages in major load centres, regional networks have been formed covering the north-east, north, east central and north-western regions. Each regional network consists of three to four provincial grids. Interconnection among regional networks would reduce the need to transport coal over long distances and would improve the dispatch of electricity and meet peak loads. The present project seeks to *interconnect* between central and north power regions.

PRC gives high priority to infrastructure development in its poorer and underdeveloped region in the western and central region. These regions cover two-third of PRC's land areas and are rich in clean energy resources such as gas and hydro power which remain largely unutilised. It is suggested that the project could be redesigned, if possible, and the interconnection between 'west and east' as against the proposed connection between 'central and north' power regional grid, be considered. This may help the poor in many ways such as: 1) Western regions are poor and underdeveloped, as is the central region, and any growth of the energy industry resulting in generation of surplus power, and its transmission from the west to the east would have a positive impact on the poor via employment and growth of the economy; and 2) the eastern region may not have to use inefficient and old coal fired power if electricity from clean sources is transported from the west to east. The adverse effect on health and environment in the eastern region, especially on the urban poor will be reduced if the old and inefficient coal fired plants are closed down in the east.

Suggested poverty impact analysis

The poverty impact analysis should be carried out on the following parameters:

- Macro economic effects affecting poverty reduction
  - Efficiency gains: calculate the value of energy saved using prevailing power tariff. Take the proportion of government spending on poverty

  reduction program as the proportion of benefit likely to accrue to the poor
  - Increase in tax revenue due to increase in employment in agricultural and industrial/commercial sectors. Calculate benefit likely to accrue to the poor
  - Use increased cropped area for calculation of agricultural income, and incremental output from new and existing industries for calculation of income from industrial areas. Calculate the share of the poor
  - Fiscal stability due to increased revenue to government. Also indirect macro economic benefits such as second tier employment and income gains
- Benefits on the consumption side
  - If beneficiaries are identifiable (namely the transmission facilities connecting to non electrified area), use methodology of chapter 3
  - If beneficiaries are not identifiable, but the region receiving the incremental/improved electricity is known, use methodology of Chapter 3 (based on the main economic activity, incidence of poverty, availability of forms of energy, etc.) through sample survey
  - In addition, the trickle down effect due to economic growth induced by the availability of electricity to the poor are likely to benefit the poor
- Environmental improvement
  - Calculate the net environmental benefit due to closure of inefficient coal fired power plants in the east; the poor (urban/rural poor) will benefit disproportionately. As an approximation, calculate the poor's share in the population as the proportion of the benefits accruing to the poor in the total.
  - Calculate the employment loss to the poor (e.g., unskilled labour) due to closure of inefficient coal fired power plants.
- Calculate macro PII as indicated in Chapter 3

Project 6: Urban environment improvement project (PRC)

Under the CAP, the project has been classified as ODI with environmental protection being its cross-cutting priority. Urumqi is rated as the fourth most polluted city in the PRC.

Air pollution control in Urumqi city is a sub-project of its 'Blue Sky Programme', which plans to improve the situation so as to return 'blue skies' to the city during winter. Further, in order to control severe air pollution in urban areas, especially in southern district of Urumqi, it has been suggested to use the heating source of Xinjiang to supply heating for city's southern district. More than 100 small scattered coal boiler houses will be demolished under the project. In the city, due to rapid economic development, its vehicle fleet has increased rapidly. Vehicle pollution is affecting environmental quality, in addition to the impact on human health. The project thus envisages to improve living conditions and quality of life in Urumqi by conversion of vehicles enabling them to use clean fuel. Further, in the city, the existing natural gas distribution system is underutilised. It supplies clean fuel to only 40,000 households, against its capacity of 250,000. The project is expected to cover 340,000 households by 2010. Finally, the Shui Mo river being the sole source of living, industrial production and agricultural irrigation in Shui Mo district, is highly polluted. The project, thus, aims to reduce water pollution in the river.

Suggested poverty impact analysis

The poverty impact analysis should include the following parameters:

- Environmental improvement
  - Estimate the extent of environmental improvement due to closure of old coal fired boilers. The urban poor are more vulnerable to environmental degradation.
  - Estimate the health impact due to district heating programmes; estimate impact on urban poor households, if any.
  - Use of clean fuel in vehicles: urban poor more vulnerable to air pollution
  - Use of clean fuels (e.g. gas) by households. Address the issue on accessibility and affordability by urban poor. Calculate the gain to the poor.
    - For the time saved in cooking, value the same.
    - Health impact on urban poor women due to use of clean fuel.
  - Reduction of water pollution
    - Estimate health impact on urban poor.

Remarks

- Use participatory approach to obtain womens' suggestion as to how the project can maximise its poverty reduction impact, and enhance the welfare of women and other disadvantaged groups.
- Project classification is thematic- environmental protection'.
- Use the poor's share in the population as the proportion of benefits accruing to the poor, although this is a conservative estimate.

Project 7: Rural Electrification Project (Philippines)

In the Philippines, about 9170 *barangays* (23 per cent of the total) remain un-electrified. Of these, about up to 4000 are being considered for inclusion under the off-grid electrification, the remaining under grid based electrification. The ERPA (Energy Resources of the Poverty Alleviation) programme of the Philippines Government[17], inter alia, includes rural electrification, as well as a livelihood generation programme in rural areas through grid based, and non grid based rural electrification. Government's strategy for the 'grid electrification' in rural areas is to make provisions for direct government subsidy to finance unviable electrification project (which would be withdrawn eventually with increased consumer density in the area), and to implement a utility efficiency improvement programme and the reduction of technical losses of the electricity cooperatives and rehabilitation of the existing lines. In contrast, the 'off-grid solution' for rural electrification includes identification and characterisation of *barangays* for scheme NRSE application, enhancement and encouragement of private sector participation, implementation of projects through local level participation, delineation of the role of stakeholders, etc.

The livelihood and income generating programme of the government through grid based electrification is expected to enhance agriculture and economic productivity through provision of power to infrastructure (such as irrigation system, handicraft machines, refrigeration plants for agricultural products), and provide social benefits by providing power to facilities to households and/or communities (such as *barangay* halls, street light, rural health clinics, etc.). In the case of the 'off grid based' livelihood programme, the government's programme has envisaged identification of potential livelihood/income generating opportunities through *barangays* (such as small rural industries, household enterprises).

Against the above scenario in the Philippines, the CAP 2001-03, has adopted the Rural electrification project for implementation in the Philippines. The project has been classified as ODI with private sector development as its cross cutting objectives in the CAP. A project TA (being financed out of the Japan Special fund) of October 2000 however indicated that the project will assist in reducing poverty in selected rural areas through an electrification project that will increase the efficiency of existing operations, accelerate electrification within the franchise areas of select electricity co-operatives, and link those electrification programmes to livelihood and rural development projects that will ensure sustainable development.

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[17] Based on the discussion with the officials of the Department of Energy, Government of Philippines during a field visit on October 26, 2000

In fact, our discussion with IEEN officials revealed that considerable efforts are being made to re-orient the project for maximising social impact. The detailed terms of reference for the PPTA included the following:

- System rehabilitation and upgradation.
- New connections within electrified areas.
- *Barangay* selection keeping in mind project sustainability and overall objectives of poverty reduction. In particular, those *barangays* will be selected where electrification can generate livelihood and rural development projects.
- Targeting livelihood and development projects towards poor and poorest in the communities.
- Measures for removing barriers for accessing electricity.
- Grid as well as off grid extension.
- Review of national electrification administration.
- Involving private sector through joint venture or other arrangements to help improve EC's performance.

Suggested poverty impact analysis

The poverty reduction potential of the project can be assessed by estimating benefits to poor on the following:

- Benefits at the consumption end
  - Calculate the benefit to the poor in the household sector (Use framework: Chapter 3)
  - Calculate the benefit to the poor in the industrial/commercial sector (Use framework: Chapter 3)
  - Calculate the benefit to the poor in the agricultural sector (Use framework: Chapter 3)
- Calculate macro economic and direct impact at supply end (Use framework: Chapter 3)

Remarks

- Use participatory approach to finalize the project design. Use PIR to see whether the project is of PI/CPI category. Thematic classification is economic growth. Assess women's views/perceptions on project design/components.

- Collect pre-project baseline data for both project (treatment) areas, and non-treatment control areas to be used in connection with monitoring of the living standards of the poor at regular intervals. The evaluation is expected to show how the determinants of living conditions of the poor are changing over time in project areas compared to control areas due to the intervention of the rural electrification project.

Project 8: Strengthening transmission system for rural electrification (Philippines)

The CAP 2001-03 has classified the project as ODI with PSD (private sector development) as its cross cutting objective. The traditional objective of this kind of project is to ensure reliable power supply and, thereby, accelerate economic growth. Project components usually included under the project are the following:

- Setting up transmission line, and strengthen substation expansions.
- Installation of additional power transformers and circuit breakers.
- Improve power system operational efficiency by strengthening load dispatch and communication systems.

Suggested poverty impact analysis

The poverty reduction analysis should:

- Estimate value of electricity saved due to efficiency gains. Calculate the poor's share in the amount
- Estimate the increase in tax revenue in agricultural/industrial/commercial sector, due to additional income/employment. Calculate the poor's share
- Estimate the available incremental electricity in residential, agriculture and industrial sectors. Calculate the benefit to poor in the above sectors by using the recommended 'framework' (chapter 3).
- Discuss fiscal stability due to increased revenue to government. Also outline indirect macro economic benefits such as second tier employment and income gains.

Project 9: Outer island electrification (Indonesia)

The CAP, 2001-03 has classified the project as economic growth. The project is expected to benefit people and communities in outer islands (outside Java-Bali) and economically less developed regions. It has been estimated that about three million people who do not have access to electricity would be provided with such access over a period of three years. At present, the OIE (Outer Island

Electrification) Programme is carried out mainly by PLN (Perusahaan Perseroan (Persero) PT Perusahaan Listrik Negara), a national power utility. In addition, there are three Rural Electric Co-operatives (KLPs) which function as vertically independent utilities. Further, about over 17000 privately owned and unlicensed micro enterprises in rural areas, sell electricity to a few households (typically 5-25), usually employing small diesel generator, (1-5 kilovolt-ampere), which are generally availed of by the well-off households in the area.

Project scope and objectives considered traditionally:

- Enlarge power distribution network to connect new consumers.
- Increase sub station capacities to meet requirements of new power demand.
- Implement new transmission lines to remove transmission bottlenecks.
- Increase supply using off grid options through renewable and indigenous sources when the same is economically justified.
- Establish institutional capacity to manage electricity supply on a sustainable basis.

In this regard, a PPTA (August 2000), seeks, interalia, to formulate a long term power development strategy, and to arrive at least cost solutions to meet the assessed demand for maximising the economic, social, and poverty impact, as well as to draw up a realistic five year investment plan for extension of electric supply through expansion, and upgradation of the existing system and construction of new systems. It would also identify the highest priority components of the project in terms of poverty impact, and environmental benefits, provide input for tariff structure, and indicate various measures so that the poor can avail of electricity services.

It is recommended that the choice of areas should be based on the poverty concentration in the outer islands including areas such as south Sumatra, central and south Sulawesi, east Nusa Tengara, and Irian Jaya, as well as remote areas[18].

Suggested poverty reduction analysis

The poverty reduction analysis can be made as follows:

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[18] A remote area is defined as the existence of a set of conditions: heavy dependence on subsistence agriculture, herding and/or gathering by most of the population. Other conditions include poor transportation, absence of connection to reliable, grid based electricity, low usage of other commercial fuels, poor access to health and educational services. Remote areas are not integrated to the rest of the economy (ADBTA No. 3056 PRC).

- Macro level effects on poverty reduction
  - Estimate the income to government due to incidence of tax on the additional income/employment in agricultural and industry sectors. Out of this gain, calculate the poor's share
  - Discuss fiscal stability due to increased revenue to government. Also outline indirect macro economic benefits such as second tier employment and income gains
- Environmental improvement
  - Estimate the impact on environment for the use of grid/off-grid electricity instead of the electricity generated at present, by diesel generators. Poor are more vulnerable to environmental degradation
  - Estimate loss of employment due to closure of diesel generator set
- Rural electrification: effect on poverty reduction at electricity consumption stage
  - Estimate benefits accruing to poor in households, agriculture and industry[19] sectors by using framework suggested in Chapter 3
- Use PIR to show whether the project conforms to PI/CPI

Project 10: power rehabilitation II (Tajikistan)

A participatory approach similar to one which was undertaken in the power rehabilitation project (2000) in Tajikistan, is recommended in this case during the project design (See Annexure 4.1) stage.

Suggested poverty impact analysis

The project officer should carry out the poverty reduction analysis on the following lines:

- Macro economic effects on poverty reduction
  - Modify the arguments as suggested in the case of the Shen Da project (PRC: Case 1). Estimate macro benefits as suggested in chapter 3.
- Use PIR to show the relative benefits to poor for classifying the same as PI/CPI

Project 11: Sub-regional power transmission link (Kyrgyz Republic)

The project[20] will link the power systems of various CIS Republics': Kazakhstan (thermal), Kyrgyztan, Tajikistan (hydro), and Uzbekistan (thermal), and other Republics such as Turkmenistan.

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[19] Industry sector includes the industrial and commercial sector

Suggested poverty reduction analysis

The poverty reduction analysis should discuss:

- Efficiency improvement
  - Impact on tariff downwards: positive impact on consumers including the poor. Estimate such benefits.
- Environmental improvement
  - During peak period, hydro power will be used instead of thermal power. Estimate the environmental benefit for less generation of thermal power. Estimate the benefit to the poor. Use the poor's share in the population as the proportion of the benefits accruing to the poor.
- Macro economic effects on poverty reduction
  - Modify arguments as used in the Shen Da Project (PRC: Case 1). Calculate the benefits as suggested in chapter 3.
- Calculate PII as indicated in chapter 3

Other IEEN projects

Out of the 16[21] projects in IEEN's 2001-03 pipeline, the remaining three projects, as indicated below, were not discussed:

- Power Sector SDP-II (Indonesia)
- Decentralised rural renewable energy development (Kazakhstan)
- Environment Improvement (Kyrgyz Republic)

Of these projects, in the case of Power sector SDP II (Indonesia) project, the analysis of the Power Sector Restructuring Project (Indonesia) in Appendix 5.1, and the observations made therein, are applicable. The decentralised rural renewable energy development (Kazakhstan) project has the potential of direct poverty reduction. In this regard, our observations at Appendix 5.1 may be noted while designing this project. It is understood that the environment improvement (Kyrgyz Republic) project is put 'on hold'. Thus, the same has not been discussed in this chapter.

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[20] The project details are inadequate for substantive comments Beyond the information as stated here, no other information was made available to the team

[21] Rural Electrification under the "agriculture and natural resources" sector (Philippines) and outer island electrification II in Indonesia could be examined on similar lines as Project 7 and Project 9 respectively under this chapter.

Annexure 1.1

List of ADB officials who attended the seminar in Manila, January 19, 2001

IEEN

- Mr V Bohun
- Mr K Moinuddin
- Mr C Melhuish
- Mr S O'Sullivan
- Mr S Tamondong
- Mr S Rao
- Mr J Ordona
- Mr A Tewary
- Mr P Abeygunawardena
- Mr S Vivekananda
- Mr A Huq
- Mr C S Chin
- Mr G Wilson
- Mr Q Bo Lin
- Mr E Hassing
- Mr H Wang
- Mr Y Zhai

IWEN

- Mr Khalid Rahman
- Ms Carol Litwin
- Mr Hyong Jong Yu
- Mr John Kuiper
- Mr B M Karunaratne

EDRC

- Mr T Bayarsaihan

PE(I)
- Mr Neeraj Jain

ENVD
- Mr S Tahir Quedri

OESD
- Mr Edy Brotoisworo

Annexure 1.2

List of officials met during the study

Asian Development Bank
- Mr K H Moinuddin, Deputy Director
- Mr P Nielsen, Deputy Director
- Mr H S Rao, Manager
- Mr P Abeygunawardena, Senior Economist for Environment
- Mr Anil Tewary, Senior Power Sector Specialist
- Mr A Huq, Senior Project Engineer
- Mr G H Wilson, Senior Financial Analyst
- Mr C Ramachandran, India's Executive Director to ADB
- Mr N Ganguly, India Director's Adviser
- Mr T Duncan, Project Economist
- Ms Carol Litwin, Poverty Reduction Specialist
- Mr C C Yu, Evaluation Specialist
- Mr N C Rayner, Senior Economist
- Mr R S Bolt, Economist
- Mr R R Nangia, Senior Evaluation Specialist
- Mr Y Zhai, Energy Specialist
- Mr B Q Lin, Project Economist

National Electrification Administration
- Ms Nelia F Irorita, Manager

National Power Corporation
- Ms R E Roldan, Senior Community Relations Analyst
- Mr A G Milano, Engineering Specialist

Annexure 3.1

Participatory study on power and poverty in Tajikistan[22]

Background

Tajikistan is composed of four geographically isolated regions: Gorno-Badakhshan, Khatlon, Lenninabad, and RSS. It is landlocked and bordered by Afghanistan, P R China, Kyrgyzstan, and Uzbekistan. The population in 1997 was six million, of which 5.9 per cent is 60 or older. The annual population growth rate is recorded at two per cent. The population is concentrated in only seven per cent of the territory with 93 per cent of land being too mountainous for human habitation. Seventy-two per cent live in areas classified as rural.

Tajikistan has very high levels of poverty. A World Bank report indicates that roughly 85 per cent of the population has incomes inadequate to meet basic food needs and insufficient resources to cover all basic needs of shelter, clothing, education, and health despite supplemental coping strategies. Some of the poverty is cyclical with shortages of fuel during winter and food shortages during spring.

The relative position of women has deteriorated based on the UNDP Gender-Related Development Index, which fell from 0.571 to 0.534 from 1995 to 1998. Women are more likely to be unemployed than men with unemployment rates of 18 and 16 per cent, respectively. This excludes hidden unemployment, involuntary part-time workers, and discouraged workers, which will inflate unemployment figures. Women's wages average US $2 per month as compared with men's wages at US $8 per month. Women's labour participation rates are highest in their forties when children are likely to be adolescent or leaving home. Among persons over the age of 16, 52 per cent of women are not in the labour force as they are engaged in home care activities. As a result of transition, particularly due to the closure of child-care facilities and the increasing reliance on home-produce consumption, women now bear most, if not all of the burden of work within the household. Women spend an average of 6.3 hours of unpaid work (cooking, work on private plots, cleaning, laundry, etc.) compared to 3.3 per day by men. Many women, particularly in the rural areas, lack access to domestic appliances that might ease the burden of domestic work. This is exacerbated by the lack of a reliable energy According to the SSA/WID Survey (1998), use of child-care facilities is low, particularly in the rural areas (19 per cent) due to cost and other concerns including the lack of heating. The war left an estimated 20,000 widows and 55,000 orphans

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[22] The excerpts are taken from the study conducted under TA 5894-REG: Facilitating Capacity Building and Participatory Activities II.

The six years of civil conflict and natural disasters have severely damaged the infrastructure in the energy sector, particularly in the rural areas. In addition, the conflict resulted in resources being diverted from much needed rehabilitation in the power sector. In 1998, the Government of Tajikistan requested the ADB's financial assistance to rehabilitate and strengthen critical generation, transmission, and distribution systems of Barki Tajik (BT), the state-owned power company. ADB has proposed a power rehabilitation project which will have an impact on poverty reduction by (i) improving reliability of power supply throughout the year; (ii) improving the quality of life in rural communities through making available electricity for heating, lighting and cooking; (iii) improving health and education facilities; (iv) creating income generating opportunities for wheat grinding and improving irrigation for agriculture; (v) saving time for rural households in searching for alternative fuels; and (vi) introducing tariff reforms to ensure increased access to affordable electricity for the poor.

Power rehabilitation project

The project aims to (i) improve quality of life and support core-poverty intervention through increased availability of electricity; and (ii) assist in the post-conflict economic recovery of Tajikistan. This will be achieved by increasing the availability and reliability of energy supply in an environment friendly manner, by rehabilitating generation, transmission, and distribution facilities

Participatory assessment study

A. Terms of reference

Because of the poverty reduction focus of the power rehabilitation project, an assessment of the stakeholder's views, needs, priorities, attitudes and perceptions, using a participatory approach, regarding the project was deemed necessary. The participatory study had the following terms of reference:

1. Determining the spectrum of stakeholders including those directly and indirectly affected by the project, particularly the poor and those who are vulnerable in terms of gender, age, ethnicity, and displacement; those indirectly affected such as non-government organisations (NGOs),

community development organisations (CDOs), private sector, relevant government agencies; and international organisations.

2. Conduct at least five focus group discussions (with about five participants each) in the project area to assess views, needs, and preferences of beneficiaries and affected stakeholders regarding the provision of electricity, and identify both direct and indirect effects of the project on the poor. The focus group discussions should obtain from participants: (i) an energy resource inventory showing energy facilities, energy sources (generation plant, fuel supply, depot), household appliances requiring energy (heater, electric stoves, radio, etc.) of poor and vulnerable groups in the project area, (ii) information for the preparation of an energy use map; (iii) seasonal demand and supply details to prepare an energy calendar showing demand and supply of energy in different periods of the year; (iv) views on energy costs (electricity, gasoline, kerosene, diesel, liquefied petroleum gas), energy quantities consumes, and ability and willingness to pay for electricity and other sources of energy; (v) historical information on the state of energy supply/availability; (vi) details for a poverty casualty chart and perceptions on the importance of the project's component in alleviating poverty; (vii) poverty levels, poverty related indicators, income and consumption patterns, and income distribution in the project area, and views on whether the project can be considered a core poverty intervention.
3. Conduct three small participatory workshops (about 7-15 participants) focusing on priorities, attitudes, and perceptions regarding the provision of electricity in reducing poverty. The workshops would develop the results of the focus group discussion, particularly in areas where different opinions are held.
4. Organise and conduct a planning workshop in Dushanbe with participants (approximately 15-20) from direct stakeholders, representatives from Barki Tajik, NGOs, CDOs, private sector, relevant government agencies, international organisations, and other relevant stakeholders. The workshop should provide an understanding and assessment of the poverty reduction impact of the project, that can be used for planning purposes.
5. Prepare a draft report integrating the results of participatory activities and information collected from other sources. The report should contain recommendations on the incorporation of poverty reduction components in the project design and specific suggestions to ensure the poor's increased access to electricity. Recommendations must be consistent with ADB's

policies/guidelines on poverty reduction, criteria for subsidies and all other relevant aspects for project preparation.

B. Methodology

A poverty profile for the area where the project's poverty reduction objective would be largest was prepared prior to fieldwork. It is based on secondary data, particularly from the 1999 Survey of Living Standards of the Population of Tajikistan. The profile formed the background for decisions regarding points to investigate and tools to use in undertaking the participatory study. The team held discussions to identify the stakeholders of the project. Based on ADB's Mainstreaming Participatory Development Processes, four basic groups were identified as stakeholders namely: village residents who will be directly affected by power rehabilitation, CDOs, NGOs, and representatives of businesses and industries, who will be indirectly affected by the project; the government; and the ADB. The main tool used was a modified form of participatory rural appraisal. It involved going to households and gathering neigbours to use local knowledge in obtaining conditions, traditions, and social structures in the area. Through discussions, information relevant to the project were obtained. The focus group discussions and workshops used semi-structured interviewing, preference ranking, modelling, and seasonal/historic diagramming.

Direct and indirect beneficiaries were involved in focus group discussions in the villages and workshop-type/town hall discussions. The team prepared forms based on the objectives of the study. Forms were fine-tuned after initial participatory activities, based on the response of participants. This included shortening and combining some tools, and changing the tool – for example, it was decided that ranking was to be used more often, rather than getting direct quantitative information because the focus group participants were more comfortable with this process, and the time spent on the tool was less. Although it sacrificed some detail, it was decided that keeping the focus group discussion under two hours was important to sustain participants interest After two focus groups, the team had realised which tools require more explanation, which could cause confusion, and which were straight forward enough to be asked without much explanation. Subtle tactics to prevent an outspoken participant to dominate the discussions were also discovered. Among this was the rotation of who was to speak first. This was especially valuable where women participants were concerned. The team generally asks to look at the host household's dwelling to supplement observations gathered during the focus groups. Several communities were selected based on the different conditions in the project area.

The team decided that workshops would be in the more interactive forms of "town hall" meetings. Tajikistan's organisational structures allowed the team to organise workshops in Jamoats. These small workshops had the purpose of gathering information not obtained in focus group discussions, and verifying any conflicting information. The materials for these workshops were initially the materials, which the first focus groups were not able to complete, but these tolls eventually evolved into a set of materials, which were used in all workshops, to assure triangulation. The team decided to focus on fewer issues and allow more insights because of the larger number of participants. Those attending the workshops were selected by the Jamoat head based on recommendations of the team on the composition of participants. In general, the Jamoat head chose local leaders. This produced a more outspoken group compared with households. Although this generally hastens the time that important information is gathered, it sometimes has the drawback of creating debates on issues not directly linked to the project. However, the team always takes care to explain that there are no wrong opinions, hence lively discussions usually ensue. With proper direction, these experiences show that there are enough leaders in the community. This is crucial when evaluating the possible success of efforts to empower people.

Based on gaps during focus group discussions and workshops, three special discussions were held to verify facts gathered. The team noticed, for instance that the participation of women in focus groups was less than the men. This is due to cultural reasons. Hence, the team made efforts to have discussions with groups consisting entirely of women. The team also noticed that in workshops, more often than not, the administrative heads were more outspoken than the rest of the group. Hence a special discussion was held with community leaders, to crosscheck the findings from the workshops. Finally, since focus group discussions resulted in consensus, an intensive discussion was held with one household to see the patterns in consumption and expenditures, particularly those relating to energy. By and large, the special group discussions yielded results consistent with the findings in focus groups and workshops, however, there are also additional insights derived from the special discussions.

A planning workshop was also designed to involve central government planners from the various ministries and relevant line agencies, business and industry groups, international organisations, and NGOs. The whole-day workshop was held to develop a common understanding of what is required for the project to attain its poverty reduction objectives. Participatory activities held under the study suggests high level of popular interest in the process, as confirmed in the planning workshop. Several recommendations highlight the importance of shared activities within communities, requiring participatory approaches to develop a sense of ownership and commitment to the activity.

Annexure 3.2

TOR for assessing women's perception on energy projects design

Objective

The objective of this proposal is to bridge, through participatory approach, the existing information gap between the ongoing PPTA and information that will be required for incorporating components in the ensuing project that would maximise benefits to women and other disadvantaged groups.

Proposed activities

ADB would assess women's views on the proposed project's contribution to the satisfaction of basic human needs including drinking water, food availability, health aspects and working atmosphere in modernised industries. It is also proposed to ascertain women's suggestions on how to maximise poverty reduction impacts of the project and enhance the welfare of women and other disadvantaged groups. The consultations will be carried out in various forms such as field studies, individual interviews, group consultations, meetings and workshops in selected project areas.

The consultation and other tasks of the proposed gender and development study will comprise of the following activities

i) Conduct participatory field studies, interviews and group discussions to identify and analyse views, needs, and preferences of the women stakeholders.

ii) Conduct participatory workshops with small group discussions, soliciting the active involvement of women taking part in decision making.

iii) Recommend possible options to maximise gender unbiased development impacts under the proposed projects.

Focus of the participatory approach

The assessments will be carried out taking energy availability as a whole and electricity in particular, according to the tools, methods, and guidelines given in the World Bank's Participation Source Book (WBPSB), the wealth of experience gathered by ADB, the Gender Analysis Framework explained in ADB Handbook for Practitioners (World Bank), and other project processing organisations. The participatory workshops and discussions will be held with women stakeholders from the project areas, representatives from the respective provincial power companies, non-governmental organisations, and community development organisations. Specifically, representatives from all women stakeholder organisations will be invited to attend all major workshops.

Schedule

A team of consultants from DMCs will be hired to conduct the participatory consultations. It is expected that the consultants will overlap with the PPTA consultants and assist in the incorporation of gender and development components in the proposed project. The consultants should have a social sciences background, experience in gender analysis, participatory approaches, and experience in poverty-related work in energy projects. The consultants will work very closely with the women's organisation in the DMC.

Output

The output of the proposed gender analysis exercise will include: (i) an objective assessment of the women stakeholders' views, needs, priorities, attitudes, and the perceptions about the proposed project, and (ii) recommendation of options to maximise gender unbiased development impacts under the project. The outputs should also include recommendations concerning (i) the incorporation of components that will enhance project benefits for women, and (ii) specific suggestions to ensure the increased access to electricity for women. The recommendations must be consistent with ADB's policies/guidelines on gender and development, poverty reduction, criteria for subsidies and all other relevant aspects for project preparation.

Input requirements

The input requirements for the study should be for 60 person days.

Annexure 3.3

TOR for using participatory field surveys to assess ex ante impacts of energy projects[23]

Chapter 3 provides step-by-step guidelines for conceptualisation, design, implementation and monitoring of energy projects to maximise their impacts on poverty reduction and to assess such impacts. The steps involved are summarised below:

- Demarcate the project areas of influence.
- Estimate the proposed consumption of energy by different sectors.
- For the energy sector, select beneficiaries through random sample basis (for example, use stratified sample). Consider poor and non-poor in the case of household sector. Use multi-stage sampling.
- Collect data as indicated in Table 3.1 in chapter 3.
- Estimate the benefits (total and those accruing to the poor) during the construction and operation stages of the project and following consumption of incremental energy (made available by the project) in the residential, agricultural and industrial/commercial sectors.

Chapter 3 illustrates how extensive field surveys in the early stages of the energy project cycle, are an important step not only in impact assessment but also in ensuring that energy projects are designed to ensure maximum permeating of project benefits to the poor.

Objectives of field surveys: the importance of adopting a participatory approach

Such surveys would serve several useful objectives including.

- Assessing the current poverty status of the target population for construction of poverty profile of the region,
- Identifying the communities affected directly and indirectly by the project, with particular emphasis on groups most vulnerable by income, age, sex and ethnicity and those adversely affected by the project; gaining insights into their perceptions, attitudes and priorities,
- Assessing the needs and priorities of the population in the project area of influence to strengthen the problem tree and objective tree analyses,

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[23] This annexure draws from the ADB report on *Participatory Study on Power and Poverty in Tajikstan.*

- Investigating what other infrastructure, policy or institutional measures would be required to ensure that project benefits permeate to the poor with a view to ensuring that these stakeholder priorities are built into or combined with energy projects to ensure maximum poverty reduction impact
- Collating data for quantitative ex ante assessment of poverty impacts through surveys and structured interviews of households, farmers, industrialists, medical professionals and labourers to (See Table 3.1)

The most crucial inputs from these field visits would be in terms of garnering the involvement of key stakeholders, especially the most vulnerable groups and the communities likely to be adversely affected. For this it is necessary that these surveys be conducted in a participatory non-threatening manner, wherein the survey teams are "less extractors of information and more catalysts and facilitators" and the local communities "articulate their priorities" (Chambers 1991)

Proposed activities and methodology

The Terms of Reference of such an exercise are indicated below:

1. Identify the stakeholders including those directly and indirectly affected by the project, particularly those who are most vulnerable in terms of income, gender, age and ethnicity and those likely to be adversely impacted by the project – either directly or indirectly.
2. Adopt a participatory approach – through workshops, household surveys, focus group discussions, participatory mapping and modelling to assess the perceptions and priorities of stakeholders
3. Conduct detailed literature review and structured interviews to collate data required for ex ante poverty impact assessment (listed in Chapter 3 -Table 3.1).
4. Organise and conduct a planning workshop with participants (approximately 15-20) from direct stakeholders, representatives from utilities, NGOs, CDOs, private sector, relevant government agencies, international organizations, and other relevant stakeholders. The workshop should provide an understanding and assessment of the poverty reduction impact of the project, that can be used for planning purposes.
5. Prepare a report integrating the findings of participatory surveys (including needs, priorities and concerns of local affected communities) and assessments of likely poverty impacts based on discussions at the workshop with various stakeholders. The report should also contain data collected

from household surveys, interviews and literature surveys to feed into the quantitative assessment of poverty reduction impacts. The survey teams should also put forth recommendations to ensure that the poor gain access to the energy provided by the provided project and poverty reduction impacts of the project are maximised. Such recommendations could include the incorporation of specific project components (e.g. grid extension to a particularly poor cluster of villages); enabling mechanisms (e g. credit scheme for very poor families to incur upfront costs for access to electricity) and investments in social infrastructure (e.g. in street lighting). These recommendations must be consistent with ADB's policies/guidelines on poverty reduction, criteria for subsidies and all other relevant aspects for project preparation.

The general proposed methodology is as follows:

- Prepare poverty profile for the area where the poverty reduction objectives would be the largest, prior to fieldwork.
- Identify stakeholders of the project through discussion; use ADB's 'mainstreaming participatory development process' to identify basic groups among stakeholders (e.g. residents directly affected by energy projects, representatives of industries, business who would be indirectly affected by the energy projects, and government, ADB).
- Conduct focus group discussions to gather information on local conditions, traditions, and social structure.
- Through informal discussions, obtain perceptions and concerns of the local communities about the proposed project
- Use semi-structured interviewing, performance ranking, modelling and seasonal/historic diagram in obtaining information.

Deliverables

The outcomes/deliverables of this exercise would include:

- Poverty profile in the project areas of influence.
- Objective tree following the cause-effect analysis on poverty.
- Components that enhance benefits to poor.
- Specific suggestions to ensure increased access of energy to poor.
- Recommendations on options to maximise poverty reduction impacts under the project.
- Calculation of PIR/PII and recommend classification of project (as PI/ CPI/thematic).

Input requirements

The input requirements for the participatory approach should not exceed 60 person days.

Annexure 3.4

Field Visits to Central Luzon, Philippines – 16-19 October 2000

Introduction

The IEEN is currently undertaking a staff study to examine ways and means to maximise poverty reduction impacts of its energy projects. The Indian TERI (Tata Research Energy Institute) staff along with Dr Piya Abeygunawardena, Senior Environment Economist, IEEN, ADB, visited Central Luzon, Philippines from 16-19 October and met with a cross section of stakeholders of ADB supported energy projects[24]. A list of officials as well as other stakeholders met during the field visit is attached as Appendix 1.

Objective

The basic objective of the visit was to understand attitudes, beliefs and perceptions of a cross section of the stakeholders of ADB supported energy projects in the Central Luzon.

Main observations

Brief meetings and discussions were held with the officials of the executing agencies, such as the National Power Corporation (NPC), to gain a broader understanding of the project impacts on the poor. Eleven beneficiaries were met, and focus group discussions as well as informal interviews were held. A summary of the main observations is given below while more details are given in Appendix 2

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[24] This visit coincided with IEEN's loan review mission comprised of Y Zhai (Mission Leader), Perry Canlas and Letty Tayag. We acknowledge their support and NPC's hospitality very much. The area covered during the visit include Loan No. 1398 PHI. Northern Luzon Transmission and Generation Project and Loan No. 1288 PHI Power Transmission Project.

Energy linkages and poverty alleviation outcomes

The various linkages between energy and the dimensions of poverty[25] (income, capabilities, security and empowerment) were evident in the field:

Income

- Income from business - dependent on electricity, is a source of income for the poor, therefore, electricity is a major vehicle for income.
- Reliable supply of electricity is essential for continued source of income to the people. Brownouts were reported to be one of the major problems in some parts of the project areas, and also one of the reasons for unemployment and loss in business in some cases.
- Accessibility is a function of affordability and reliability: cost of accessing modern energy services was reported to be high and one of the major reasons for not using such services, though available.

Capabilities

- Electricity enhances the quality of life: it provides entertainment.
- Higher forms of energy (e.g., gas) reduces indoor pollution compared to biomass use, but due to the non reliable supply of such energy, people often resort to traditional forms of energy, leading to loss of productive time (collection).
- Energy is essential for complementary infrastructure (water supply).

Security

- Energy is also viewed as a "source of security" to people (e g., illumination).

Empowerment

- Lack of involvement of the people during project designing has led to negative impacts of the project: like accidents and fires in some distribution segments of the project areas.

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[25] Except a few, most of the beneficiaries belong to the higher energy ladder and the urban periphery of the region. The official (1994) income based poverty line is P 8,885 per person per annum. A typical Philippino poor (income based) household has an average family size of six or more members, headed by a male household head less than 50 years old, with little or no schooling, more economically active than the rest of the population with substantially higher labour participation rate, lives in a rural area and engaged simultaneously in as many as four or more income earning activities, and that if living in urban areas, derives income from agriculture, construction, and transport (Baliscan and Fujisaki, ed. 1999)

Project design issues

- Generation and transmission power projects are by and large growth-oriented projects. These projects generate income directly at the project site through employment of labour. The end beneficiaries are not generally identifiable and spread over the geographical areas, whenever electricity generated or transmitted, is fed into the common grid. Thus, the headcount index for determination of poverty reduction impact is not easy.
- The poverty reduction impact of the above type of projects could be maximised if the distribution components of the electricity supply pertaining to these projects are also strengthened as a part of the original project, subject to financial viability for the new component.
- The end beneficiaries of electricity can get maximum benefits if the transmission and distribution system losses are reduced. This will lower the electricity tariff at the consumer end. However, tariff policies should be suitably designed if the potential benefit has a disproportionate effect in favour of the poor.
- Participation of people in the distribution of electricity is desirable. Rural co-operatives operating through local village groups for some distribution function such as billing and collection, are some of the institutions that use this concept.
- If the energy sources are geothermal or other national resources such as hydro, people in close by areas are compensated for the depletion of national resources.
- Unless tariff and up front costs, along with suitable micro credit, are suitably designed, many poor people may not afford modern energy.
- Electric supply to remote areas is often cost ineffective, and thus requires innovative policy.

Appendix 1

A list of people met during the Mission

Antonia Lopez, Principal Engineer A, Masinloc Thermal Plant.
Antonio G Milano, Jr, Engineering Specialists B, San Manuel Sub station.
Apolinar Mariano, Jr, Control Engineer, San Manuel Sub station.
Candido Villanueva, Principal Engineer C, San Jose Sub station.
Claudio Fomella, Former Plant Manager, Tayabas Sub station.
Conrado R Bartolome, O&M Manager, Masinloc Thermal Plant.
Ed dela Torre, Division Manager, South Luzon Transmission Line Reinforcement Project.
Eugene H Alfonso, Acting Plant Manager, Masinloc Thermal Plant.
George Luceno, Project Manager, Batangas Transmission Reinforcement Project.
Henry Joseph Bambao, Operator/Engineer, Labrador Sub station.
Homer Crisologo, Principal Engineer B, Batangas Sub station.
Jesse Tampo, In-Charge of Science Information Center and Chemical Laboratory Center, Mak-Ban Geothermal Plant
Jesus Echon, Sr, President, Samahan Pagkakaisa ng Relocatees ng Bani (SPRV)
Jose Mari S Danao, Supervising Engineer, Projects Evaluation and Review Office, NPC.
Lito Flores, Site Engineer, Zapote Sub station.
Malu Edillor, Community Relations Officer, Masinloc Thermal Plant
Manny Mina, Sub station Engineer, San Manuel Sub station.
Norberto Dennis Lacap, Principal Engineer B, Masinloc Thermal Plant.
Relly de Leon, Principal Engineer C, Tayabas Sub station.
Romeo Espinosa, Site Manager, Sto. Tomas Project Office.
Ronald Cueto, Supervising Engineer, NPC.
Ronald Macalino, Principal Engineer C, Sucat Sub station.
Ronaldo David, Special Assistant to Manager, Northern Luzon Transmission Project.
Rosemary E Roldan, Senior Community Relations Analysts, Batangas Transmission Reinforcement Project.
Vic Rodil, Right-of-Way Officer, Batangas Transmission Reinforcement Project.
Vicente de Guzman, Plant Manager, Sucant Sub station.
Virgelio S Navarro, Plant Manager, Mak-Ban Geothermal Plant.
Yongping Zhai, Energy Specialists, Energy Division (East), ADB.
Zosimo Carranza, Project Manager, Northern Luzon Transmission and Generation Project.

Appendix 2

16 October 2000. L-1288 PHI: Power Transmission Project

The objectives of the project are to expand and improve the transmission networks to increase their power transfer capability, provide adequate system reliability and security in the context of the ongoing generation expansion program, develop DSM oriented power tariff, and enhance the in house engineering capabilities of NPC.

The project component consists of Luzon transmission (erection of 125 km of 500 km transmission line from Tayabas to Dasmarinas, 30.5 km of 230 kV line from Pagbilao to Tayabas, 21 km of 230 kV line from Dasmarinas to Zapote and 13 km of 230 kV line from Binan to Sucat, construction of sub stations at Tayabas and Zapote sub stations, and expansion of the sub stations at Dasmarinas, Binan and Sucat), and Mindalco Transmission (Erection of 142 Km of 69 LV transmission lines, construction of Nasipit sub stations, expansion of the sub stations in Tagoloan, Gen Santos, Tindalo, Badas, and Butuan).

During the day, the Laguna Sub station Centre AII was visited. The station has 40 employees, some of whom are women. Met Mr Joseph Remorosa of Kalayaan, an employee in the sub station. He lives in the urban area, owns TV sets, has access to electricity (for which he spends Peso 500), uses gas (for which he spends Peso 250), uses firewood in emergency from his field, and owns a refrigerator. He views electricity as a vehicle for his improved living.

Visited Tayabasa sub station, which employs only two technical persons, and 12 other personnel. Only two shops are seen nearby. The sub station is fed by power generating station at Pegbilao, which transmits the power to Laguna, Bulacan, Dasmarinas, etc. It also feeds power to Miralco for distribution through rural co-operatives to the Lucena city/Quezon areas (end customers). The following are the details of various meetings:

1) Met Ms Maria San Pedro through the assistance of Mr CR Sumlang, the *Barangay* Captain of Quezo village. About 700 families reside in the area. The electric appliances in her family include computer, water pumps, electrical ranges, TV sets, radio, refrigerator, cell phone, etc. Her family income is P 20, 000 per month, of which she spends P 1106 for consumption of electricity. Electricity came to the village about 15 years back. For cooking purposes, she uses gas. She does not use fuelwood, although her father does, collecting it from the nearby field.

The electricity is supplied by Quezon Electric Co-operative, which charged a tariff of US 12.5 cents per kWh for the month of August 2000. Ms. San Pedro considers the tariff very high. Brownouts in the area are not uncommon: sometimes about four to five hours a day. Children and women are mostly affected due to lack of electricity. Health services, education of children, lighting, and employment (Ms Pedro is self employed) are affected. The electricity is convenient, but is found to be quite costly. She is however willing to pay more, even up to P 1200, if there is a reliable electricity supply. There are electricity meters, and the billing staff collects the consumption data every month. She uses ground water for cleaning with the help of electric pump She also uses municipality supplied tap water for drinking.

Ms Maria San Pedro is unable to explain precisely what is meant by "poverty", but stresses that her children should not suffer from "poverty".

She is very critical about the operation of the Electricity Co-operative. According to her, it does not protect their interests. No dividend of the co-operative has been distributed to the members so far. She felt that the high electricity tariff is due to cost (e.g., mark up) to intermediaries such as the Electricity Co-operative, and suggested that the NPC should supply electricity directly to the end consumers without routing it through Meralco, and the Quezon Rural Co-operative.

Safety of the distribution lines in the area is unsatisfactory. A few years back, around five people died due to short circuit fire.

It was stated by the *Barangay* Captain of Quezon village that there were no consultations before the ADB transmission project was undertaken in the area, and the consultation process should be initiated before undertaking such project.

2) Met Ms Aneeta in the Quezon area. She has six children and stays in a single small room. She uses three 100 watt light bulbs, and has TV, radio, iron, and rice cooker. She uses gas for cooking, and electricity for other purposes. Her youngest child of 12 years of age, goes to high school, and her eldest son of 33 years old owns a shop next to her house.

The areas are affected also by brownouts. Without electricity, the most affected person in the family is the woman. Gas is preferred for cooking, and during the electricity failures, she uses candles for lighting, which affects her health.

Electricity is used in the areas in health clinics, school, and community centres. Even for community networking, the use of electricity is welcomed.

She is not able to describe what is meant by "poverty", but said that she could feel the same. She felt that cost of electricity is very high, and should be reduced.

They were not consulted, as reported by her, before the ADB project was undertaken in the area.

During the visit, it appeared that the distribution authority (the Rural Co-operative) did not take sufficient care for the safety of residents: electric poles used are of temporary in nature, and wire is connected from the poles to the houses in vulnerable ways. During 1995, there was a big fire, and it may happen at any time. The distribution segment of the electricity supply needs to be strengthened in the area.

October 17, 2000 visit to Batangas transmission reinforcement project.

The San Pascual transmission line project is the identified interconnection facility connecting the San Pascual cogeneration power plant to the Luzon power grid through Batangas sub station, Batangas city and Calaca switchward within the Batangas coal fired thermal plant in Calaca Batangas province.

About 140 persons within 8 km T/L right of way from San Pascual to Mahabang Parang in Batangas city would have to be rehabilitated under the project. The compensation consists of, wherever applicable, a) land to be acquired as sites as sub stations and non agricultural lands within the T/L right of way to be paid as replacement costs equivalent to the current fair market value, b) easement fees for agricultural land along the T/L ROW tracts equivalent to 10 per cent of the land's current market value, c) tower occupancy fee equivalent to 100 per cent of the current market value of the area, d) compensation for the crops/plants and trees, e) compensation to houses and structures, f) financial assistance to agricultural tenants/occupants of the agricultural lands, and g) disturbance compensation equivalent to daily minimum wages in the project affected areas multiplied by sixty days.

3) Met Ms Nicolas, one of the persons likely to be relocated under the above project. NPC had taken sufficient care to convince her about the size of the compensation package and the importance of the project. She is likely to purchase land near her family.

She feels that the project would help her in establishing business such as a piggery out of the compensation money. NPC has consulted the staff before the relocation package was announced. Thus, under the project, the compensation money given by the NPCO would help the relocated people in setting up various business, and this would in turn would generate employment in the areas.

Electricity is a part of her daily necessity. It has economic/infrastructure value: electricity helps running health clinic, school, market building, water system with efficiency.

4) Mr Gregorio Marino, employed as Secretary in the *barangay* office, owns a TV, refrigerator, radio, gas stove, etc. He uses LPG gas for cooking, as well as fuelwood during the non-availability of gas. The team was unable to collect a record of how often this happens. In fact, gas availability is high in Manila so, its lack may seem contradictory in an area in Luzon, which is close to Manila. Firewood is collected from the field, but trees are replanted for mitigating forest degradation. Fuelwood is easier to collect. He uses kerosene for lighting during electricity failures.

He has a plot of land for growing vegetables, and land for a house He feels that in *barangay*, life without electricity may not stop, but in an urban area, the poor are the most affected without electricity.

"Poverty" is described by him as a "situation where the family just meets the subsistence needs, and should not have adequate means to meet the expenses of their children's education, and can not afford to protect their health". Electricity in his village helps in generating employment through weaving work (in the village, about 1000 people are employed), poultry, business, etc. The health clinic also uses electricity, and helps the poor in addressing their health problems.

He pays Peso 7 per litre for purchasing kerosene. Water is obtained through a water tap supplied by the local authority. He is willing to pay more for consumption of electricity if there are less failures, and greater availability of reliable power in the area.

5) Met Ms Rosemary of the Social Engineering Department of the NPC. She is in charge of resettlement schemes under the NPC power project. As a part of the resettlement schemes, the NPC takes into account the confidence of the affected persons, local municipality, *barangay*, provincial government, etc, before deciding or awarding compensation money to the relocated persons.

She felt that a power transmission project assures reliable power, which has many indirect benefits, and it is difficult to identify the direct beneficiaries, once the electricity is put into the common grid via the transmission lines. Some employment could be generated at the time of construction of the transmission project (which may be the direct benefit of the project). In order to make it socially oriented, a) the transmission company should share some benefits with the local *barangay*, municipality, or provinces as is being done in the Philippines for generation projects. (Under the Energy Regulation 184 of the Government of Philippines, an electricity generation company is required to pay a certain percentage of its sale proceeds to the local bodies including the *barangay*). This income sharing by the NPC with the local government/local bodies may also result in better acceptability of the transmission project among the residents including the poor in the area instead of the frequent perception that the projects do not belong to their areas, b) it should work more towards end consumer satisfaction, and therefore, there should be some livelihood component under the transmission project, and c) the transmission project should also have some component in the distribution segment of the electricity system so that end consumers including the poor are directly benefited by the project.

6) During the visit to the geothermal plants at Bitin Bay, met Mr Eduardes D Onal, and Ms Emeslie S Dabiente, who are working in the multi-purpose co-operative society at Bitin Bay. The co-operative has 150 members, lends money to its members (at an 18 per cent rate of interest per annum, and requires collateral for loan amount beyond Peso 20,000), and buys the produce from its members. It was set up in 1992 with the help of the NPC with a grant of P 100,000 and an interest free loan of P 300,000. It now makes a profit, even after maintaining 23 field workers who work under a contract with the geo thermal plant at Bitin Bay for the cleaning services.

In the *barangay* adjacent to the geothermal plant, under the National Wealth Tax laws, local residents are entitled to get free electricity. Most houses in the area do buy gas for cooking purposes.

The co-operative is run by an elected Board.

7) Met Mr Domingo Maranan of St Vicente Santo Tomas Batangas. He is a self employed person, buys raw coconut at P 7 per kilogram, and sells at P 20 per 100 gram of copra after drying the raw coconut, to the nearby market. After processing 1000 coconuts, he can get about 150 kilogram of copra. He finds that electricity helps him in continuing his work during the night.

He has a plot of land with fruit bearing trees. He uses firewood for cooking and uses electricity sparingly due to its high costs. He pays P 490 per month (minimum being P 300) for the electricity consumed by six light bulbs, a TV and a refrigerator. There are electricity failures situation in the area, sometimes, for two hours. During such times he uses candles or a flashlight. The electricity connection costs are very high, and he had to pay P 2000 for such a connection which includes costs covering the costs of meter, and the connecting wire from the poles to the house. His house has a meter, which is read every month, and he pays for the electricity bill on monthly basis.

His children are going to school. He feels that electricity helps in the children's education, and without that, his children can not study during the night. He fetches water from a distance, for which he uses his own motorised transport.

According to him, he belongs to the category of 'poor' people. His definition of poverty encompasses "a situation when he does not have any work, no food, and his income is not sufficient to meet his daily needs. His children have to be sent to the school, and if he is unable to do this duty, he should be categorised as a person falling under the 'poor' group"

8) Met Ms Oring Karalipio of *barangay* San Tolome, Santo Tomas. She has nine children, and 12 grandchildren who give her enough support in running the family.

She has various electrical appliances such as fans, light bulbs, TV, refrigerator, radio. She uses firewood as fuel, which she usually collects from a nearby forest. She pays P 500 (minimum) and P 800 maximum for the consumption of electricity. Electricity consumption is metered, and bills are paid monthly. The electricity failure is occasional in the area, and it lasts for about two hours, sometimes twice in a week. During such times she uses candles. Connection charges to the extent of P 3800 had been paid to Meralco, an electricity distribution company in the area.

Her son is working in a "ready to wear" factory nearby. The raw materials are collected, and are sewn in the factory. If there is no electricity in the area, there would be no work. The family is willing to pay more for consumption of reliable electricity, as this would mean increase in income through additional production in factory. The family recognised the income generating capacity of reliable electricity supply, as without electricity in the factory, her son does not get any wages. However, the WTP more has to be within the family's capacity to earn additional income, as, if the increase in electricity tariff is too high, the family will not be able to divert necessary funds from another essential expenditure or savings.

According to the family, poverty implies a "situation when people are sick, and they can not be given medicine, and can not be shown to the doctor. It also implies a situation when one can not send his children to school".

October 18, 2000. Loan No. 1398 PHI: Northern Luzon Transmission and Generation Project

The principal objective of the project was to ensure the reliability of electricity supply in Luzon areas through expansion of NPC's network and generation capacity The transmission activities are, interalia, needed to integrate the output from Sual and Masinloc power stations with Luzon grid. Thus, the project consists of a 88.75 kilometer, 230 kV double circuit transmission line from Masinloc to Labrador; a 22 kilometer 230 kV double circuit line from Labrador to San Jose; new 230/500 kV sub stations at Labrador and San Manuel; expansion and upgrading of the 230 kV San Jose sub station; installation of the second 300 MW generating set at Masinloc power station

9) Met Mr Antonio G Milano, Jr. Officer in Charge of the San Manuel sub station. The sub station has been in operation since January 21, 1999. It gets electricity from the coal fired Masinloc generating station. The sub station feeds various distribution companies and NPC. It employs 40 people. There are a few pending "right of way" cases under the project.

10) Met Mr F M Cepezo, General Manager, Pangasinan Electricity co-operative Ltd (Panelco III). The Co-operative gets electricity supply from NPC through its sub station San Samuel. There are 87442 (1998) connections. Of this, 60 per cent belongs to the residential category, and of this, 85 per cent falls under the rural areas. The energy consumption per type of consumers (1998) is. residential 60625[26] MWH, commercial 22178 MWH, industrial 11971 MWH, public building 2804 MWH, and others 4684.

With the operation of the San Manuel sub station, the consumer satisfaction has gone up, and the demand has increased by 11 per cent since last year. This increase has been significant in the rural areas. The average connection in such areas has increased, and the total electricity consumption has also gone up in the area. All rural areas have been electrified, but the actual total connections are only 71 per cent (1998).

The electricity is finally distributed to the end consumers through the BPA (Barangay Power Association), whose activity is only restricted to meter reading and collection of money, for which the BPA is paid a discount. The electric line connecting from the sub station to the end customers is maintained by the Panelco.

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[26] This roughly comes to a consumption level of 100 kwh/month per connection.

The average tariff is about P 4.70 per kWh, while it purchases the same at P 3.22 per kWh from the NPC. The average connection fee is P 2000. The distribution losses are 16 per cent (1998) covering technical and non technical losses. There is no lifeline tariff, and rich and poor pay at an equal rate. Rate is the same irrespective of the sources of the power. Variation of rates is subject to the approval of the Energy Regulatory Board. Its rates are higher than the Meralco Distribution Company, as Panelco has more rural consumers, and unlike Meralco, it can not cross subside the poor at the expense of the urban customers. So far, the basic rates remain unchanged for the last five years, but the Panelco pays discounts on this rate as a part of its income dividends to the consumers. Recovery rate from the residential consumers is very good.

Panelco finds it very cost inefficient to supply electricity to remote and isolated areas. In Annan village, Panelco has set up 4 km lines for covering poor customers where the monthly consumption of electricity is less than 50 kWh.

It also has a Social Support Scheme wherein a scholarship is provided to a poor member's family subject to certain criteria, medals are distributed during the graduation ceremony, computers are distributed to the educational institutions, etc.

Every consumer, by virtue of its connection, is a member of the Rural Co-operative Society. Rather than introducing additional profit earning activities, Panelco distributes profits through discounts to its members. It is considering distributing dividends to its members every year, and the details are being worked out.

Mr Cepezo felt that ADB could help the poor people by a) strengthening old distribution sub stations, b) helping Panelco to reduce distribution losses (technical) thereby allowing Panelco to charge lower tariff from the consumers, c) helping suitable rehabilitation of poor people, d) creating an industrial centre in the villages wherein the special lower tariff could be made applicable to those areas surrounding the rural industrial centre. In the areas normally served by Panelco, it would be difficult to implement a tariff policy, which could discriminate the consumers on grounds of poverty. It was suggested that the ADB identifies poor areas, and builds industrial complexes. Thereafter, the Panelco could offer lower rates to industrial areas. Panelco is considering divesting its share up to 40 per cent.

11) Met Ms Kalma, a widow in the Panelco distribution area, who has three children: two are going to school and an older other daughter is going to college. She is self-employed in the fishery business. She buys raw fish from the fish market, smokes them and sells them everyday. She earns P 400 everyday, which is just enough to meet her expenses towards education of her children.

She uses electricity for lighting the house, and watching TV. She can not afford to purchase a refrigerator or rice cooker. She pays P 300 per month for the consumption of electricity. During electricity failures, she uses candles. She uses gas for cooking, and also uses firewood/charcoal for the same. She cuts trees during the summer, and uses them for the above purposes throughout the year. She considers that the electricity tariff is very high, and does not want to pay more even if there is reliable power. She recognises that without electricity her business would go down, thus reducing her livelihood. Electricity makes her feel safe during the night, helps her children whilst they study.

She thinks that she is a "poor" person, as she is finding it difficult to support her children's education, especially after the death of her husband.

12) Met Mr Dinotabula. He does not have any electricity in the house for the last 20 years, although his neighbours have According to him, the connection costs are prohibitive, and he can not afford the same. He uses a kerosene lamp (costs P 1.50 per litre) for lighting, and charcoal for cooking. If the connection costs are waived, he would opt for the same. He is a carpenter, and so is his son. He earns P 200-300 per carpentry job. With electricity he would have earned more. He does not consider himself belonging to the lowest category of poor people.

Visited a manufacturing premises, M/s Urdaneta Metal Craft Side unit. It employs 10 staff members. It uses electricity for making frames of a "three wheeled cycle". The owner pays P 2500 for consumption of electricity for the manufacturing business. During electricity failures, the business suffers. If it is a long blackout, Panelco gives advance intimation and the employees do not come to work (the employees work on a piece rate system).

13) Met Ms Agsalud, wife of the incumbent Vice Mayor of the city area. In one corner of her residence, she has a printing shop. She employs workers in the shop, which during the peak season, increases up to 15 people. The workers are very poor, and without the work, they face problems in the family. The wages vary from P 170-250 per day. If there is no electricity, employment suffers.

She pays P 3500 every month, for the consumption of electricity in the printing press.

She feels that ADB projects can help the poor if the electricity tariff is lowered. This can be achieved through the reduction of the system losses. A little reduction has a high value to the poor people. Electricity, according to her, is a basic need for her life. Although, poor people prefer food and shelter as priority items, electricity generates employment which keeps the poor sustain themselves. In rural areas, electricity is required for generating employment. In rural areas if employment is generated, people will buy appliances, for which they would require electricity. The workers have fans and bulbs in their houses. Without electricity, and thereby without employment, they would fall below the poverty line.

According to her, ADB projects may cover rural areas, or distribution zones which are poor areas, and the distribution system should be strengthened. A cluster of Rural Electricity Co-operatives in poor areas should be considered by ADB for their strengthening. Under a transmission project, a livelihood component may be added for making it more poverty reduction oriented.

October 19, 2000. Visit to Masinloc Power station of the NPCO

14) Met Mr Eugene H Alfonso, Acting Plant Manager, Masinloc Coal Fired Thermal Power Plant. The plant has a capacity of 600 MW, which is roughly 30 per cent of the total NPC capacity. It is expected to produce 4204 GWH electricity every year when it runs fully. At present, Unit I is running, while the unit II is yet to function fully. Against the unit I capacity of 300 MW, it is working with a capacity of 235 MW.

Under the Energy Regulation 184 of the Government of Philippines, the management is required to set aside P0.01/KWH for development purposes in the local areas for projects to be approved by the Department of Energy. The projects are required to be submitted by the local authority including the *barangay* of the area. The details of devolution of funds are yet to be worked out. The units employ 294 regular employees, and various contractors who bring many daily wage labourers to the premises.

The units use Australian coal. The fly ash generated under the project is bought by a private firm for making porcelain. The unit relocated 300 families during the process of establishing the plant. Met Mr Jesus Echon Sr, President of the SPRV, an association of the relocated residents. The relocation has taken place in an area adjacent to the plant site.

15) Mr Echon is a self employed person. He owns one tricycle for transporting people in the area, a TV, and a refrigerator. He cooks food by using firewood collected from the nearby forests. Before the commencement of the project, he had three hectares of land 15 mango trees and a fish pond. These are now acquired by the authority. The compensation paid to him did not cover the future earnings of the fruit trees, and he is not able to buy new property due to low compensation. Prior to the operation of the plant, he did not use electricity. Now, he consumes monthly electricity worth P 800-1006. He gets drinking water from the tube well. Electricity has changed his life pattern in several ways.

Annexure 5.1

Analysis of select IEEN projects

Case 1: Power transmission connection and reinforcement (RRP: PHI 29505, May 2000)

The project was initially conceived as a PI (poverty intervention) project, with growth as its SDO (Secondary Development Objectives)[27]. It was expected to target 40 per cent poor beneficiaries in Philippines as against the national average of 37.5 per cent population lying below the poverty line.

The project was stated to have pro poor sustainable economic growth focus, which was based on the findings of a 1998 PIA study saying that a one per cent point increase in GDP leads to 0.94 per cent of increase in employment, on the fact that the project will facilitate implementation of the rural electrification programme in Philippines, and finally, on the general presumption that availability of electricity in rural areas will enhance the productive use of labour resources to maximise household income. The project is also expected to address good governance, and social development aspects of project development. However, at the RRP (Report and Recommendation to the President) stage the project had been classified as pro-poor economic growth as its primary objectives.

The project objective, as per the RRP, is to provide high priority transmission facilities required to facilitate the TRANSCO's privatisation operation in Philippines in order to introduce the operation of the competitive market. It is expected to meet the incremental demand of residential, commercial and industrial consumers in Mindanao, being one of the poorer regions in Philippines, with its lack of electricity and percentage of electricity more than national average. The project RRP, qualitatively described the benefits out of the projects accruing to the poor in the region.

The project RRP document calculated project benefit distributions (among poor, non-poor), and determined the poverty impact ratio. It was indicated that a substantial portion of the net project economic benefits (to the extent of 28 per cent) will go to the poor, and the project can achieve its primary objectives of pro-poor growth.

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[27] Internal note of IEEN (Oct 1, 1999).

The project RRP, however, did not identify the number of *barangays*, which would require further rural electrification. In addition,

- It did not establish any parameters for measuring project's poverty reduction impacts in respect of target (as well as control) population during and beyond the period of project implementation.
- It did not indicate whether project components were formulated or confirmed through the participatory approach during the PPTA stage.

Case 2: Sixteenth Power (Masinloc thermal power) project (Loan No. - 1042 - PHI)

The main objective of the project was to augment the base load generating capacity of the Luzon grid by providing an efficient and economic supply of electricity. The power plant (2 x 300 MW) utilises low sulphur coal imported from Australia, PRC, and Indonesia. Raw water for the plant is sourced from the nearby Lawis River, while the sea water for condensing the steam is obtained from Oyon Bay and used sea water discharged into the bay. The Project Completion Report (PCR) was prepared by the Bank in October 1999.

It was considered as growth oriented project, and only social issues considered under the project were the resettlement issues for a fishing community of 198 households from the plant site. The direct benefit to displaced families in the vicinity of the project is however unrelated to the poverty reduction impact of the project; at best it can be considered incidental to the project interventions. The fact that the energy produced at Masinloc would be used to create wealth in factories and other economic institutions, and to promote social development in schools or hospitals, has not been recognised in the RRP. No quantification of benefits accrued to the poor was accordingly indicated in the RRPs.

Case 2: Wind power development project (Loan No. 1818 PRC)

The project was initially conceived as PI with environment as its SDO[28]. In 1999, it was envisaged that the project would benefit poor by improving their health and living conditions through improved power supply in an environment friendly manner, and assist the government in addressing certain governance and social development issues. The project components comprise of construction of wind farms at Dabancheng in the Xinjiang Autonomous region, at Fujin in Heliongjiang province, and at Xiwaizi in Liaoning province, steps for barrier removal, and institutional strengthening to promote wind based power generation in the three regions.

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[28] Internal note of IEEN (Oct 1, 1999).

At the RRP stage, the project has been reclassified as an environment project. The project, as indicated in the project RRP (September 2000), seeks to produce electricity in an environment-friendly manner and increase the share of wind-based electricity in overall power generation through establishment of grid connected rural farms, and thereby, avoid emissions of sulphur dioxide (11000 tons), nitrogen oxide (7400 tons), total suspended particles (5000 tons) and carbon dioxide (1.94 million tons) associated with thermal power generation. The estimated net present value of the environmental benefits from avoided air pollution at the national level is about US$12.3 million, while the net present value of global environmental benefits from avoided CHG emissions is estimated at US$14.2 million at the minimum.

A further perusal of the project RRP would show that the urban as well as rural population in the three regions, on an average, has an average income well above the annual per capita national income as defined by ADB for the purpose of defining the poverty level[29]. On the poverty reduction aspects, the Project RRP stated that "clean energy projects such as wind farms would contribute to poverty reduction by avoiding environmental pollution, which disproportionately affects the poor, and by creating new job opportunities". It further calculated that a minimum of 390 job years for operation and maintenance of wind farms would be created, and also stated that there will be transfer of turbine technology from abroad to PRC, which would create 17 job years for each MW manufactured in PRC. The project RRP also mentioned that under a proposed JFPR (Japanese Fund for Poverty Reduction) financed sub project, off grid electrification of poor communities in the Xinjiang region would be considered through the installation of the wind turbines. Since it was classified as environment project as its primary objectives, neither benefit distribution among poor and non-poor nor PIR was calculated for the project. Interestingly, IEEN has recently conducted a study[30] (October 2000) for ascertaining the views of women on project's contribution to the satisfaction of basic human needs, and for ascertaining their views on poverty reduction impact of the project. The study concluded that:

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[29] The PRC considers an annual income of Y 635 per capita as poverty line. ADB uses as the poverty line an annual per capita income of Y 1000 for rural areas; an annual per capita income of Y 2000 for small island urban areas, and an annual per capita income of Y 3000 for coastal or large urban areas

[30] Under RETA 5889-Gender and Development for % 85000 approved on December 1999.

- The small power generation station by *renewable energies* would be the most cost effective investment for electrifying the poverty areas since, the average distance for wiring a non electrified township is 30-40 km, and the mean cost is 90 thousand Yuan per km, which is considered very high.
- Given that the most non-electrified townships are located in remote poverty areas and networking is possible only at higher costs, use of local renewable energy would be the preferred option. Wind could be one option: solar, biomass, and hydrology are also potential sources depending on local natural conditions.
- Empowering local community through capacity development is essential for better management of the project: the support personnel could be drawn from the villages.
- Given the nature of the proposed wind project activities, there is a need to co-ordinate with the on-going women improvement and poverty alleviation projects in the three provinces.

The findings of the above study would clearly show that 'participatory approach' seeking the views of the stakeholders would have certainly helped in the better design of the project for maximising its poverty reduction impact. The selection of the project site on consideration of poverty reduction, identification of the poor and non-poor in the regions, identification of causes for poverty in the regions, etc., as brought out in the study, brings out a scenario where a typical environment energy project may seem to lack poverty reduction components[31], although it is not so. An environment project has a positive impact on the poor just as environmental degradation has a disproportionate negative effect on them, *vis-a-vis* non-poor, a message which the project RRP has clearly brought out.

As stated earlier, the project calculated the project benefits 'with' and 'without' framework, and calculated

1. Avoided emission of pollutants due to the project interventions
2. Environmental benefits (in monetary terms) from avoided air pollution, and the global environmental benefits from avoided CHG emission.

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[31] In this case, the current loan classification which requires that any project (even the non-PI project such an typical environment project) should have components for poverty reduction

Case 3: Power rehabilitation project (Loan No. 11817 - TAJ)

The project was initially conceived as CPI (core poverty intervention) project, with growth as its SDO[32]. It was expected to target 70 per cent beneficiaries with, on an average, 70 per cent population falling below the poverty line. At the RRP stage (September 2000), the project has been classified as core poverty intervention, as 79 per cent of project beneficiaries lie below the poverty line.

The RRP placed the project objectives as: improving people's quality of life and support in project areas through increased availability of electricity, and assist in the post conflict economic recovery of Tajikistan. These are expected to be achieved through increasing availability and reliability of power supply in an environmentally friendly manner, and rehabilitating generation, transmission, and distribution facilities. The project components included: a) rehabilitation and power supply improvement in post war damaged areas of Khatlon Oblast, consisting of rehabilitating CHPP, strengthening transmission, and distribution networks, installing consumer meters, and provision of electricity supply to about 24,000 poor households; b) rehabilitation of NHPP and associated transmission facilities to improve reliability of power supply; c) rehabilitation of two major distribution subs stations in Dushanbe region to improve reliability of power supply to about 148,000 mostly poor households; and d) improvement of bulk metering of import and export of electricity from and to Uzbekistan and the Kyrgyz Republic.

The project identified the causes of poverty in the region during the Initial Social Analysis and subsequently through a participatory approach[33] (see Annexure 3.1). The poverty reduction impact of the project was assessed during the project preparation: through focussed group discussions, village level workshops, discussions with interested groups, and a national level consultative meeting with stakeholders The participatory process helped the project authorities to understand project's various linakges[34] with levels of poverty reduction potential in the project areas.

The project RRP also indicated additional potential for project's poverty reduction. It stipulated that (1) there were high levels of poverty incidence in the project areas particularly in rural areas; (2) that energy use had regressed from electricity in the lower rungs of the energy ladder, electricity is a basic necessity of life alongside water, food, clothing and shelter; (3) that there are high economic costs of using alternative fuels in addition to time, labour, health, social and gender impacts of the scarcity of electricity; (4) that the household recognised energy as its basic need for the large agricultural base which is dependent on electricity for its irrigation and can generate employment only when there is regular supply of electricity; (5) that provision of health services and education have been hampered due to lack of electricity; and (6) that employment and small entrepreneurial activities could only be undertaken subject to availability of electricity. It also calculated the benefit distributional analysis and PIR (poverty impact ratio), and showed that the net benefits accruing to the poor *vis-à-vis* non-poor is very high. In the case of monitoring of the project benefits at different stages of project implementation, it identified certain parameters.

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[32] Internal note of IEEN (October 1, 1999)

[33] TA 5894 REG facilitating capacity building and participatory activities

[34] See Chapter 4.

In effect, at various stages of the project cycle in the instant case, the project staff considered the poverty related issues, identified the project areas on the basis of participatory approach, and developed a mechanism to monitor the parameters for poverty reduction and to review the same at the conclusion of the project. The instant approach shows that the poverty reduction strategy should start at the early stages of the project cycle, would continue at all the stages, and should not end once the project is signed.

Case 5: Power sector restructuring programme in Indonesia (Loan No. 1673-INO)

The above programme loan had been categorised as "economic growth" with the objectives to establish a competitive market for electricity in Java-Bali which will increase economic efficiency. The programme components are:

- Restructuring the power sector and creating an enabling environment for a competitive electricity market.
- Establishing competition in the supply of bulk electricity in Java-Bali, initially with a single buyer and by 2003 with multiple buyers and multiple sellers.
- Setting tariff and ensuring financial viability of PLN (Perusahaan Perseroan (persero) PT (Perusahaan Listrik Negara) and newly created subsidiaries during the transition period.
- Increasing private sector participation.
- Strengthening the regulatory function including protection of end consumers.

The RRP, following the Bank's guidelines for the assessment of the impact of programme loan on poverty of 30 March 1995, carried out a poverty impact analysis, and came to the conclusion that programme's impact on poor is positive in all its components except in component 3 where there will be a short-term negative impact and long-term positive impact once the market distortions are eliminated and efficient use of resources is promoted. The programme loan also considered, like any other bank's public sector reform programme, social electricity development fund and social protection plan, as an ameliorative measure, rather than as a proactive measure to restructure the economy rapidly and provide jobs to the poor or near-poor. It also assumed that the retrenchment packages, unemployment benefits, targeting subsidy to poor consumers, etc., are sufficient response. Further, it stipulated that with establishment of competition of electricity in bulk supply, poor will have increased access to electricity as a direct positive impact of the programme loan. The RRP also did not address other access related issues or socio-economic dimensions[35], perhaps because the existing instructions of the Bank do not require the same for the poverty impact assessment of the program loans.

In particular, the project RRP did not indicate whether participatory approach as outlined in Chapter 3 had been adopted in this case. However, the loan has addressed some of the issues such as tariff impact on consumers, and capacity building of civil societies through technical assistance programmes.

Case 6: Renewable energy development project in China (TA 3056 PRC[36])

We present below the findings of a TA report in order to highlight the implications of energy development through the NRSE (new and renewable sources of energy) route and its potential impact on poverty reduction. The study was primarily conducted to assess the potential for commercial development of renewable energy in China. Some interesting conclusions are presented below:

- Use of renewable energy resources in China could be expanded far beyond the existing government targets at lower costs than current fuel alternatives.
- On the commercialisation of three technology sectors such as solar thermal, bagasse, and biogas, solar has the greatest potential for commercial development in China. Its potential impact is very high, as PRC can avoid installation of about 7000 MW in new power generation capacity, and

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[35] Access such as governance, discrimination, geography (poor regions), legacy (asset distribution), or socio-economic dimensions such as coping mechanisms that mitigate the socio-economic impact of economic stock, and impoverishment as a process (DAI 1998).

[36] Under TA 3056 PRC Final report as in September 2000

displace 29 million tons of carbon dioxide every year. The solar thermal and bagasse generation projects as identified by the TA, meet ADB's criteria for project assessment.

- Changes of government policy and institutional delivery mechanism would be the key to success to the above programme: all renewable energy technologies would benefit from such changes in China, as these would reduce transaction costs and improve access to credit.
- The poor can meet energy needs without burning coal by using other sources, thus a net positive impact on environment.
- The poor can access expanded employment as unskilled workers in the manufacturing and service sector: solar thermal systems employ more people per unit of energy output than conventional systems.
- Although renewable energy systems are frequently least cost options for supplying energy to remote areas, the costs of developing and installing energy systems will exceed the ability to pay by the poor in most remote areas. Most remote areas in China would require complementary government support for any loan repayment, although more advanced remote areas can repay the investments from the increased resulting income.
- Biogas in remote rural areas is a main fuel for households and accounts for about 60 per cent of energy consumption: before the introduction of biogas technology, farmers had to collect firewood and stalks for fuel causing damage to surrounding areas.
- Different forms of renewable energy have different impacts on employment generation. Bagasse cogeneration in the sugar industry in China has the greatest influence on employment: the stronger the economics of a sugar mill, the higher the employment stability for sugarcane suppliers or farmers A typical sugar mill of 5000 ton capacity will be supported by 150000 mu of land, translating into employment of about 3000 families or about 12000 people.
- Solar heating and PV industries, being new sectors in China, have the possibility of creating more jobs if expanded.

In sum, the impact of NRSE on poverty reduction may vary depending on the choice of the technologies. For instance, quality of life can be enhanced through the use of solar thermal or biogas, employment can be increased through use of bagasse or solar thermal, and health can be improved by biogas, or bagasse in rural areas of China. In addition, there is the high positive environmental impact in the areas due to the use of NRSE (New and Renewable Source of Energy): for instance less use of coal and less degradation of forests may certainly translate into high positive environment impact in the areas, having a positive impact on the poor.

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TERMS OF REFERENCE

Introduction

As a sector, energy development has both direct and indirect implications on urban and rural poverty These impacts vary depending on the energy activity Investments in traditional energy projects such as the construction of a power plant lead to direct impacts in terms of employment generation leading to increased incomes, which improves the quality of life through access to services such as health, education and housing This leads to other economic impacts such as increased productivity and diversification, and social impacts such as time savings, human and social capital development and gender impacts.

II. Methodology

The methodology will use a combination of quantitative and qualitative approaches Appropriate econometric methods need be used to understand variables such as energy consumption patterns and poverty reduction impacts Where variables are simultaneously determined, more structured models need to be used Poverty variables should be consistent with ADB's broad definition of the subject. It will not only reflect income variables, but broader indicators such as access to key services, opportunities for self-employment, and availability of infrastructure Taking note that different direct and indirect energy activities have unique impacts on the urban and rural poor, a impact matrix need to be developed

For example investments in traditional energy projects contribute to employment generation that leads to increased incomes The increased income would improve the quality of life through access to services such as health, education and housing These would lead to many other economic and social impacts such as increased productivity, time saving, better education, health and gender impacts If energy projects designed properly and target the poor correctly, then such benefits can be harnessed Otherwise the poor can be victimized in several ways—for instance displacement prior to, and affected by environmental pollution after construction However, such impacts can be understood only through a systematic approach to poverty reduction impact assessment

Direct contribution of energy projects to ADB's poverty reduction strategy has seldom been acknowledged mainly because of lack of a systematic approach to assess such impacts. Investments in traditional energy projects such as the construction of a power plant lead to direct impacts in terms of employment generation leading to increased incomes that would improve the quality of life through access to services such as health, education and housing This would also lead to other economic impacts such as increased productivity and diversification, and social impacts such as time saving, human and social capital development and gender impacts. Impacts differ in the urban and rural sectors, with a commonly held perception that the impacts are more in the rural areas.

In rural areas, there is a primary dependence on biomass and other energy sources on the lower rungs of the energy ladder Moving to the higher rungs of the energy ladder, such as the use of electricity and gas, is often difficult. The use of low quality fuel creates indoor pollution; this causes poor health particularly among women and children who spend more time indoors. Consequently, dependence on biomass has adverse environmental and health effects.

Biomass and fuelwood collection affects forests and natural resources, as watersheds are degraded and agricultural productivity can be affected leading to lower incomes for those dependent on agriculture. This in turn would increase the need for natural resource extractive practices that further damage the environment The potential approach to reducing poverty in the rural areas through energy projects is very different In the rural areas, there is a potential for core-poverty reduction energy activities

Indirect impacts, which often exceed the direct poverty reduction impacts, are more relevant in the urban sector than in the rural sector These impacts, though larger in scope, are more difficult to understand in terms of linkages between expanded energy provision and reduced poverty It can also be noted that the provision of energy will have indirect impacts on poverty reduction via the other sectors that use energy Investments in the energy sector may have little effects on poverty if these do not have implications on the activities of other sectors such as transport, industry, communications etc. The indirect impacts of energy projects on poverty reduction should consider other issues such as energy production and distribution employment generation, capital and product markets, energy efficiency and environmental impacts of energy projects. The specific terms of reference for the study is given below

This study will make a contribution to the understanding of the impacts of IEEN projects in poverty reduction A framework, with checklists and guidelines, for the design of projects and analyzing their poverty reduction impacts will be developed for ADB staff Both direct and indirect poverty reduction impacts will be identified and procedures for that will be recommended Newly revised Appendixes 25 and 26 of the ADB's Guidelines for the Economic Analysis of Projects and Staff Instructions on project classification will be extensively used in developing the recommended approaches

III. Terms of Reference

(i) Conduct a review of literature on the relationship between energy development and poverty reduction

(ii) Undertake a review of all guidelines procedures approaches and methodologies recommended by ADB for design of poverty reduction projects In particular the revised Appendixes 25 and 26 of the ADB's *Guidelines for the Economic Analysis of Projects* and Staff Instructions on project classification

(iii) Examine any possible relationship or pattern between energy use and income levels both at the macro and household levels

(iv) Examine the relative magnitude of direct and indirect poverty reduction impacts of energy sector projects Propose a methodology for identifying such impacts giving some examples

(v) Review Country Assistance Plans relevant to IEEN focussing on the main features which will have poverty reduction impacts Review the current methodology for assessing the poverty impacts of these projects according to relevant ADB policies and guidelines such as *Poverty Reduction Strategy, Guidelines for the Economic Analysis of Projects*, and *Handbook for the Incorporation of Social Dimensions in Projects.*

(vi) Based on the analysis undertaken, suggest how IEEN activities can make maximum contributions to poverty reduction. The analysis will be by energy activity, classified based on direct or indirect interventions and their impacts on both urban and rural poor

(vii) Propose project components and design elements that can maximize poverty reduction impacts This should include both new project identification and re-formulation of existing projects This should be in-line with ADB's key framework elements of pro-poor sustainable economic growth, social development and good governance

(viii) Design a framework with checklists and guidelines for determining the pro-poor growth, poverty interventions including the core-poverty intervention approaches for energy projects.

(ix) Specify data and resource requirements, particularly the required poverty profiles for the project area. The objective of the framework is to aid project design

(x) In carrying out the above, field missions will be conducted in the Philippines to agencies in the power sector and agencies dealing with poverty reduction

(xi) Make recommendations on the appropriate choice of IEEN projects in terms of investment priorities and investment strategies that could reduce poverty

IV REPORTING REQUIREMENTS

A clear focus on the analysis of project specific examples and recommendations for maximizing the contribution of energy projects to poverty reduction should be maintained A draft final report of the study should be submitted within 50 days after commencement. The ADB will prepare comments, after which the final report should be submitted at the end of the contract period